

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:

- 1934.
- Mar. 10. Lloyd's Register Annual Reunion Dinner, May Fair Hotel.
 - Mar. 15. "Some Developments in Aircraft Construction." Lecture by H. J. Pollard before R.Ae.S.
 - Mar. 21. "Some Problems of a Technical Service." Lecture by Wing Com. G. W. Williamson, before R.U.S.I.
 - Mar. 24. Services Rugby: R.A.F. v. Army, at Twickenham.
 - Mar. 28. Royal Aero Club Annual General Meeting.
 - Apr. 5. "Engines." Lecture by Capt. A. G. Forsyth before R.Ae.S.
 - Apr. 7-10. Forum Club Aviation Exhibition.
 - Apr. 12. "Speed and the Future of Commercial Aircraft." Lecture by M. Louis Breguet before R.Ae.S.
 - Apr. 16 23, 30. "Gyroscopes." Series of Lectures by Prof. J. G. Gray before Royal Society of Arts.
 - Apr. 26. "Landing in Fog." Lecture by Dr. Rüd Stüssel before R.Ae.S.
 - Apr. 27-May 6. International Aero Show, Geneva.
 - May Wilbur Wright Memorial Lecture, before R.Ae.S.
 - May 17-June 2. Royal Tournament, Olympia.
 - May 21. Guild of Air Pilots Garden Party.
 - May 26. Heston Air Navigation Trials.
 - May 27. Deutsch de la Meurthe Cup.
 - June 1. Entries close at 12 noon for London-Melbourne Race.
 - June 2. Brooklands Air Race Meeting.
 - June 3. London Aeroplane Club Garden Party, Hatfield.
 - June 9. Reading Ae.C. Annual "At Home."
 - June 16. R.A.F. Reserve Flying Club Annual Flying Display, Hatfield.
 - June 23. Lancashire Ae.C. Air Display, Woodford.
 - June 30. Royal Air Force Display, Hendon.
 - July 13-14. King's Cup Race.
 - July 3-9. 4th International Congress for Applied Mechanics, Cambridge.
 - July 7. Opening of Leicester Airport.
 - July 21-22. French Grand Prix.

EDITORIAL COMMENT



ERY clever. That is the briefest and most complete comment which can be made on the increases provided for the Royal Air Force in the Air Estimates. For once the burning question of the day was the increase in our air strength. Everyone, except the hard-bitten pacifists of the *Manchester Guardian* school, felt that the time had come to make good to some extent the deficiencies of our air defence preparations. Extremists on the other side called for the provision of 10 squadrons in the present year to complete at long last our 1923 programme. That would have been a policy of perfection which would have disregarded the claims of the income tax payer to relief. Admittedly the completion of a programme now 11 years old would not have given us complete security from air attack, but it would have been a somewhat severe setback to the financial improvement from which all are hoping to benefit, and which should make it much easier to arm ourselves sufficiently in coming years. As there is at the moment no probable enemy within striking distance of our shores, there would hardly have been justification for crippling ourselves financially to achieve incomplete security. At the same time, the Government held that the international situation ought to be considered, and that nothing ought to be done which could give other nations a chance to say that we were re-arming while urging others to disarm. We confess that we have not very much patience with the Government's long-drawn attempts to achieve disarmament in the hopes of averting war, for we do not believe that universal peace can be achieved in that way. Still, this attitude of the Government had to be taken into account. A compromise was indicated. Certainly we must increase our air strength to some degree, while not ruining ourselves or inflaming foreign passions. The general belief was that our air force for Home Defence would be increased by either three or four squadrons.

Now let us examine what has been done. As usual, a mere statement of figures is almost sure to be misleading. It is the common fate of statistics

to mislead, and hence it has been said that there are three classes of lies: Lies, Damned Lies, and Statistics. Provision has been made in the Estimates for the equivalent of four new squadrons. That is the impression which the ordinary reader of daily popular newspapers has doubtless received. He has also probably grasped the additional fact that only two of those four squadrons are for the Home Defence Force, and the average citizen has probably felt accordingly depressed. He hoped for four, and he has only got two. He has probably felt only confused by the additional statement that two squadrons at present incorporated in one of the experimental establishments will be reorganised and reconstituted on an effective basis. In reality this is the outstandingly clever feature of the Air Estimates.

To understand the point one must examine rather carefully the composition of the so-called Home Defence Force. This is a term which is constantly used in Parliament, but it does not appear in the *Air Force List*. In that publication it is shown that in the British Isles there are three Commands, namely, Air Defence of Great Britain, the Coastal Area, and the Inland Area—not counting Cranwell and Halton. Now in Parliament it is always said that the Home Defence Force consists of 42 squadrons. These are made up as follows. A.D.G.B. has 27 squadrons of regulars, five Cadre squadrons, and eight Auxiliary squadrons, making a total of 40. One of these, No. 24 is a Communications Squadron, and in its present form cannot be reckoned as a fighting unit. It is as necessary for an Air Force to have a Communications Squadron as it is for an army to have military railways and motor transport, but none of these take part in the actual battles. The number 42 is made up by including Nos. 15 and 22 (Bomber) Squadrons, which are not under A.D.G.B. but under the Inland Area. These two squadrons in their present form are only paper strength. They are composed of the Martlesham test pilots, who have to be posted to some nominal squadron for discipline, etc. Of course, if the pilots of these two squadrons were equipped with suitable aeroplanes, they would make the two finest squadrons in the country, if not in the world, so far as skill in piloting goes, though it does not follow that they would become immediately perfectly organised and trained bombing units. No. 15 B.S. possesses only eight officers and two airmen pilots. No. 22 B.S. has 13 officers and no airmen pilots, so it is obvious that they are in no case to take the field at a moment's notice. Therefore the effective strength with which the Home Defence force could engage the enemy is not 42 squadrons but 39.

By reconstituting Nos. 15 and 22 B.S. on an effective basis, the Air Estimates add nothing to our paper strength, but will in practice provide two quite new bombing squadrons. Presumably they will then be transferred from the Inland Area to A.D.G.B., and certainly their personnel will be very different from what it now is. Martlesham will have to keep its staff of highly skilled experts for test purposes, for in time of war there will be more need than ever for putting new types of aeroplanes through their flying tests with the greatest possible promptitude. Whether the test pilots will be placed directly under the Headquarters of the Experimental Establishment cannot yet be said. The point is that A.D.G.B. will gain two more squadrons, and yet the paper strength

of our Home Defence Force will remain as before. There will also be added to A.D.G.B. two entirely new squadrons, the raising of which is authorised under the Air Estimates, and so the result is that our hopes of four new squadrons for A.D.G.B. are realised.

That is quite satisfactory so far as the present year is concerned. Next year we hope that the country, less heavily taxed, will be more prosperous, and will be able to afford a more substantial increase in our fighter and bomber squadrons. At the same time, we must not forget that No. 24 (Communications) Squadron, necessary and useful as it is, is not a unit which is equipped and trained either to attack a raiding enemy or to carry the war into that enemy's country. At the end of this financial year the nominal strength of the Home Defence Force will be 46 squadrons, but its fighting strength will be only 45.

While we are gratified by the increase in the strength of A.D.G.B., we are not at all satisfied to note that the strength of the Coastal Area is to be less by one squadron than it was last year. No. 100 (Bomber) Squadron, which is equipped with "Vildebeestes," was last year transferred from the Coastal Area to the Far East Command. It moved from Donibristle to Singapore. To have replaced it could not have offended susceptibilities, for we threaten no Geneva interests in maintaining our strength in the British Isles at its last year's level. No. 100 B.S., with its torpedo-carrying machines, was not a unit of the Home Defence Force, but was what is called a coast defence squadron. It would not have engaged hostile air raiders, but it might have at least incommoded hostile naval raiders, and it was certainly an element in the general defence of these islands. When No. 100 B.S. disappeared from our Home establishment, it was only reasonable to expect that another squadron should be raised to take its place. This step has not been taken. We have now no torpedo squadron in the British Isles. Thus, while the strength of A.D.G.B. goes up by four squadrons, the strength of the Coastal Area goes down by one, and the net increase of our air strength at Home is only three squadrons. This fact should be noted by all who study our air strength.

The Fleet Air Arm is to be increased by two flights of catapult seaplanes for use on cruisers and capital ships. They will be used for naval duties only, and we are glad to see the strength of the fleet thus increased. The pilots who fly them will all be naval officers (with temporary commissions in the R.A.F.), and if the machines are multi-seaters the observers and air gunners will all be provided directly by the Royal Navy. The cost of the two flights is being borne by the Admiralty by an appropriation in aid. We must regard these flights as affording a welcome addition to naval strength.

The overseas strength of the Royal Air Force is to be increased by the addition of one flying-boat squadron. We may hazard a guess that it will be stationed at Singapore. Wherever it goes, we are very glad to see this increase in the number of flying-boat units. The Royal Air Force is still the chief agency for stimulating the development and improvement of the flying-boat class of aircraft. We hope that the new squadron will be given one of the more modern types of boat, and will not be told to carry on as best it can with the "Southamptons," discarded by somebody else.

AIRCRAFT CONSTRUCTION IN THE CHINESE NAVY

By HARRISON FORMAN

UNTIL quite recent years China has been an almost totally non-manufacturing country. It is only in the last decade or so that she has begun to enter the self-productive field. This activity has been stimulated by the awakening of national consciousness since the Revolution in 1911. Without a background of accumulative years of experimental and research work in the evaluation and use of home products, China, of necessity, had to content herself at first with simple establishments for the assembly of the segregated foreign-made parts into the finished whole. Though progress is necessarily slow owing to protracted unsettled conditions in the country, the time is fast approaching when China will become quite self-reliant in the production of the manufactured article from the wealth of diversified raw material at her command.

The construction of aircraft was more or less in the experimental and novelty stages up to the outbreak of the World War in 1914. The war gave the aeroplane a chance to prove its potential practicality. Under pressure of extreme necessity greater development in the flying machine took place in the few short years of the war than in the score of years or so preceding.

It was not until the final year of the war that China took an active interest in the construction of aircraft.



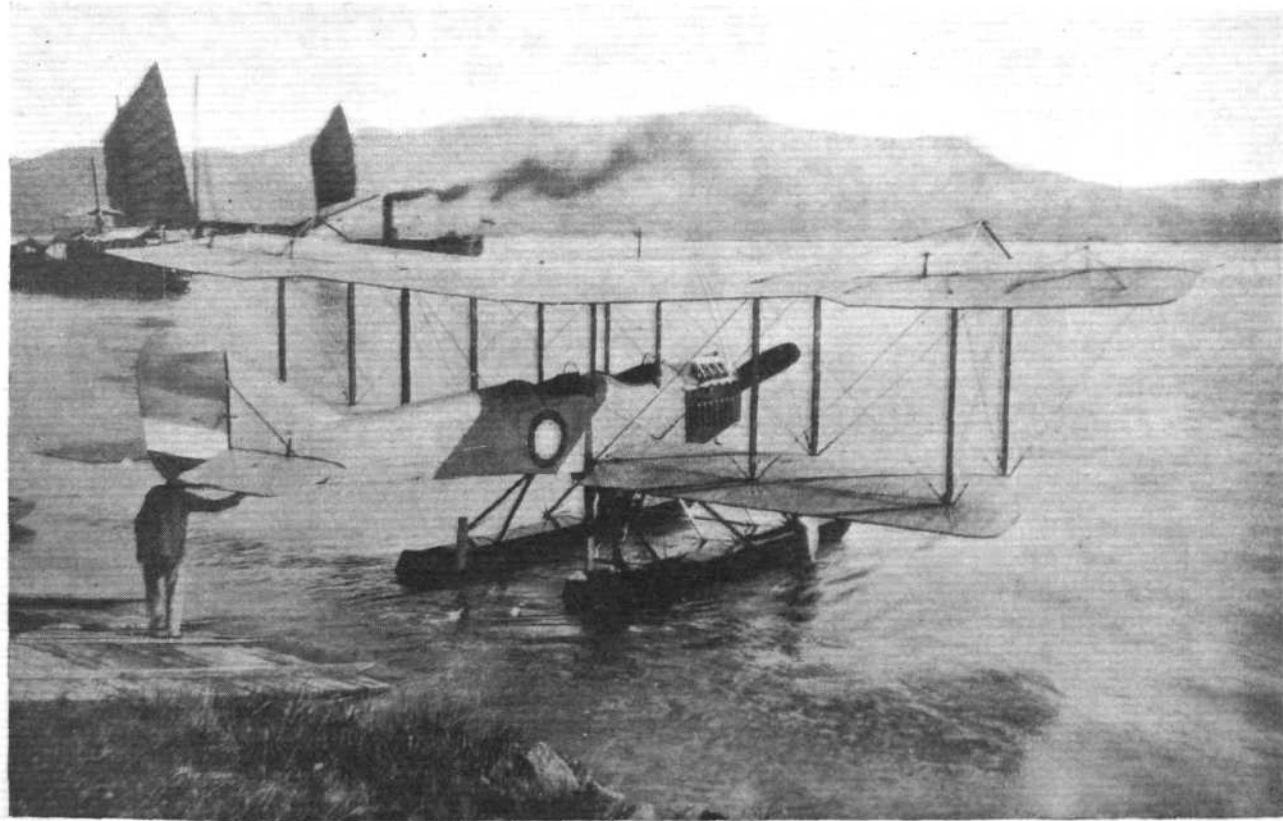
The executive staff of the Naval Air Establishment at Lungwha, Shanghai. Left to right: Capt. Tseng Yee-king, B.Sc. (present Director-General); Capt. Barr Yu-tsao, M.Sc.; and Capt. Wong Tsoo, M.Sc., A.F.R.Ae.S.

Under the supervision of the Chinese Navy the Naval Air Establishment was created in the spring of 1918, with headquarters at Foochow, in the province of Fukien.

Four well-trained men were placed in charge of the administration of the establishment, and the design and construction of aircraft. These men were Lieutenants (now Captains) Y. T. Barr (Barr Yu-tsao), Y. K. Tseng (Tseng Yee-king), T. Wong (Wong Tsoo), and S. F. Wong. Lt. S. F. Wong resigned in 1921. All of these men, besides an early training at home, had obtained extensive technical and aeronautical experience abroad—especially in England and America.

In order to save time and the initial cost for the erection of a new plant and the installation of new equipment suitable for the work contemplated, a part of the Navy-owned Government Dock and Engineering Works, commonly known as the "Foochow Dock," was allotted to the N.A.E. for its start. This included offices and workshops with some general metal-working and woodworking

machinery. General office staff, draughtsmen and workmen were at first selected from the personnel of the Government Dock and Engineering Works; these were later replaced by men specially trained at the N.A.E. Machinery, machine tools and factory buildings special to the construction of aircraft were added from time to time as



THE "CHAR": A two-seater open cockpit primary training seaplane. It is fitted with a 100-h.p. Curtiss water-cooled V engine.

THE "DING": A bomber or passenger seaplane. It has two open cockpits and a cabin with accommodation for four. The engine is a 360-h.p. Rolls-Royce.

required. Such jobs as casting, electro-plating, galvanising, etc., which did not justify costly installations of equipment owing to the limited amount of such work required, were done by the " Foochow Dock."

Up to 1917 China had little or no experience in the construction of aircraft, and the engineers in the N.A.E. were therefore confronted at the outset with a dearth of scientific information on such home products as were of likely value in aeroplane construction. As it was the intention of the officers to make as much use of home products as possible, the first thing done before actual construction began was to carry out tests and research work in order to discover materials which would have the same or equivalent qualities, properties and strength of those that had been found to be suitable and were in common use in aeronautical industry abroad. It was desirable that the materials should be easily procurable in the local market.

Timbers.—Some ten species of Chinese soft and hard woods were tested according to the best scientific standards. *Shanmu* (*Cunninghamia lanceolata* Hooker), which abounds in the mountain forests of Fukien, was found to possess qualities about equal to those of Grade A spruce as specified by British and American standards. This timber has since been used extensively in the construction of main strength members, such as wing spars, fuselage longerons, etc.

Indigenous elm (*Ulmus parvifolia* Jacq.) has mechanical properties similar to American rock-elm, and has been mainly used in the construction of seaplane floats and flying-boat hulls. Camphor wood (*Cinnamomum Camphora* Nees et Ebermaiser), and especially its roots, on account of its toughness, fineness and natural crookedness of grain and great shearing strength has proved most valuable in the making of knees or bracing members and gusset plates in the construction of floats, hulls and Warren girder type of fuselages. This wood is a special product of South China. *Baili* and *Nammu* (*Machilus ichangensis* Rehd et Wils.), also on account of their toughness and fineness of grain, have been used on minor parts of aeroplanes.

Fabric.—Of the different kinds of silk, cotton and ramie or grass cloth tested, Shantung silk and Kiangsi ramie cloth were found up to the strength requirements. A quantity of these two kinds of fabric is manufactured by the mills to the special specifications of the N.A.E., and is used for wing and fuselage covering. Shantung silk, however, has a tendency to lose its tautness under abnormally humid atmospheric conditions. As these conditions were



rather prevalent in the late spring and early summer in Foochow, the use of this fabric on those machines which chiefly operated in the South was discontinued.

Dope.—Climatic conditions also affected two kinds of dope which were formulated and used after a great deal of experimental and research work. These were later replaced by imported dopes, which were known as P.D.N. 12, a pigmented, nitro-cellulose dope, and V. 84, an aluminium nitro covering. Three coats of the pigmented dope and two coats of the aluminium dope proved very well suited to the semi-tropical climate at Foochow and the South, and never gave trouble.

Varnish and Lacquer.—For the protection of wood in the internal work, such as wing frames, fuselages, interiors of floats and hulls, a varnish made at the N.A.E. with *Tung* oil as its chief ingredient has been employed with satisfactory results. It exceeded all the requirements as laid down in both British and American specifications. Specially treated varieties of Foochow Lacquer, which is world famous, has been successfully used for protection against weather on all external woodwork, against the fouling on float and hull bottoms and against corrosion on steel fittings. Apart from its engineering value, lacquer is valuable in that it can be finished in any colour scheme desired, and gives a brilliant and perfectly smooth surface which not only reduces air resistance, but is also most pleasing to the eye. When properly prepared and skilfully applied, it is very light in weight and has absolutely no tendency to chip.

Since its establishment in 1918 the N.A.E. has produced altogether five distinct types of seaplanes and flying boats, ranging from training machines to bombing and torpedo planes. Owing to financial limitations, however, only 12 machines were constructed at Foochow. As the operations of the Navy are all on the water, and, furthermore, as there were no landing fields or airdrome available near Foochow, no land machines were constructed, although some designs for landplanes were worked out.

The first type of machines designed and constructed were training seaplanes. Their chief characteristics were low landing speed, good stability and controllability, and robustness of construction. They were designed to meet rough usage and strain of student training.

Type "Char."—This was designed for primary training. The first machine of its type was completed towards the end of 1918. It was a tractor biplane with twin-float arrangement for undercarriage. The wings and tail surfaces were of *Shanmu* and silk construction. Interplane bracing was effected by two pairs of streamline *Shanmu* struts on each



THE "YEE": This is a two-seater open cockpit advanced training seaplane, fitted with a 100-h.p. Hall-Scott water-cooled engine.



THE "BEENG": A single-engined (360-h.p. Rolls-Royce) biplane flying boat, military bombing or commercial. It has three open cockpits and a cabin seating four.

side of the fuselage, together with high-tensile steel bracing steel wires. The floats were of streamline form and had V-bottoms. Keels and chines were of elm and frames of *Shanmu*. The skins of the floats were planked by two plies of narrow thin strips of *Shanmu*. The two plies were laid at right angle to each other, each ply being at about 45 degrees with the fore-and-aft axis. Between the two plies of planking there was a layer of fabric impregnated with waterproof marine glue to ensure watertightness and strength. Each float was divided into five watertight compartments, and was designed with 100 per cent. reserve buoyancy.

This machine was powered with an 8-cylinder, V-type, water-cooled Curtiss engine developing 100 h.p. at 1,400 r.p.m. Its high speed was 75 miles per hour and landing speed 35 m.p.h.

Type "Yee."—In general construction this type was similar to Type "Char," except that the wing area was smaller and the high speed and landing speed were increased to 90 and 40 m.p.h. respectively. This type was designed for use by students after they had mastered Type "Char." It was fitted with a 4-cylinder vertical water-cooled Hall-Scott engine, the power and speed of which were the same as the Curtiss engine. It has two side radiators, one mounted on each side of the fuselage and slightly behind and above the engine, whereas in Type "Char" a nose radiator was fitted.

Both Type "Char" and Type "Yee" were designed to a minimum load factor of eight and their loaded weight was about the same, *viz.*, 2,100 lb. The range for each was about three hours, flying at high speed near sea-level. As at first constructed, the petrol tank was installed under the student's seat. Feed to the engine was therefore by pressure. On later machines, the tank was mounted in the top centre section. Feed was hence by gravity, thereby not only weight and work were saved, but, most important of all, frequent troubles incidental to the pressure system were eliminated.

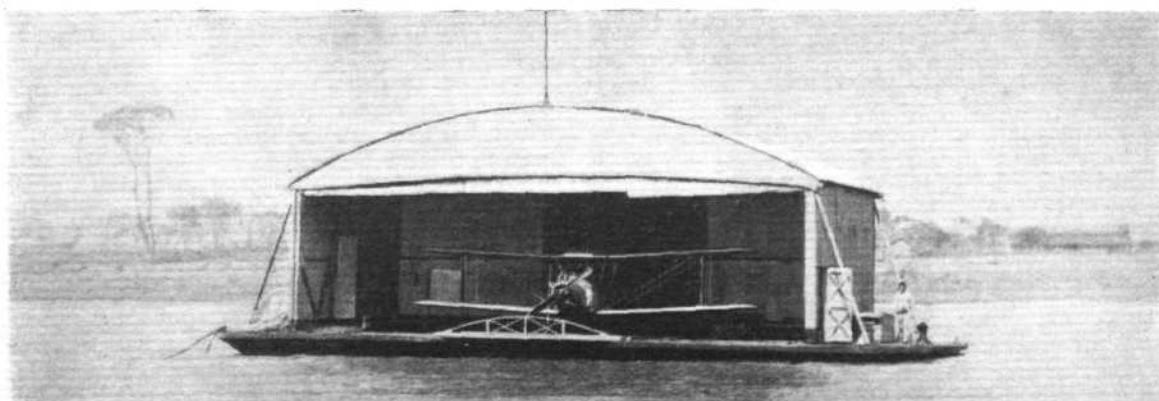
Type "Beeng."—This was a tractor biplane flying boat designed for bombing and fighting, but, if desired, with slight modifications it could be adapted to passenger carrying. As a bomber and fighter it carried a crew of three, a pilot and two gunners. The pilot's cockpit was situated

in the hull of the boat, a little to the front of the leading edge of the lower wing, where the pilot had an unobstructed view forward, sideways and downward. The first gunner's cockpit was at the extreme bow of the boat, while that of the second gunner was behind the main wings. Both gunners were provided with machine-guns mounted on Scarff rings by means of which the guns could be swung in any direction desired. With the guns thus located, the field of firing was covered in nearly all directions. The only blind spot was a small angle allowance for the tail, which was unavoidable. As fuel was contained in tanks in the upper wing, the hull space between the pilot and aft gun cockpits was free for the stowage of bombs and machine-gun ammunition. When used for passenger carrying, four seats could be quickly installed in this space. For the comfort of passengers the sides of the hull were fitted with portholes, similar to those fitted on yachts.

The power of this flying boat was supplied by a 12-cylinder V-type water-cooled Rolls-Royce engine which developed 360 h.p. at 1,800 r.p.m. It was geared and the speed of the propeller was reduced to 1,080 r.p.m. The total weight of the plane was 6,500 lb. Overall dimensions were: Span, 56 ft.; length, 39 ft.; and height, 16 ft. 7 in. The hull, which was of the flexible or Linton Hope type of construction, was 36 ft. in length.

Type "Wu."—This was an observation or general purposes machine of 120-130 h.p. It was a twin-float single-bay tractor biplane. Its chief characteristics were simplicity of construction and ease of maintenance. The Type "Wu" was distinctly marked from previous types in its fuselage construction. In this fuselage, except for the engine mounting in the nose, no metal fittings or wires were employed. It was built up in the form of Warren girders, composed of four longerons of *Shanmu* and a number of struts of the same material. The attachment of the struts to the longerons was by means of two-ply camphor wood gussets glued and copper riveted. This construction proved very rigid and strong under bending and torsional tests, and was proven entirely satisfactory in actual service. Its advantages over the ordinary braced type must be obvious, since no great numbers of metal fittings, wires and turnbuckles or special forms and jigs were required in its construction, and no great constant trueing up was necessary in service.

Three seats were provided in the fuselage, two side-by-side seats in the rear cockpit and one in the front, the floor of which was arranged to permit the installation of a camera for aerial photographic work or bomb sights and bombing controls. Except in the fuselage, all the struts in this type of machine were made of steel tubing faired



A FLOATING HANGAR: Designed by Capts. Barr and Wong, this is of steel construction and is partly submersible so that the seaplane can be taxied in or out of its hangar.

with hollow wooden tail pieces for streamlining. The engine fitted was a 3-cylinder radial air-cooled Bristol. The gross weight of this aeroplane was 2,000 lb. The span was 35 ft. 5 in., overall length 26 ft., and overall height 12 ft. 3 in.

Type "Ding."—This type of machine, one of the newest, is a bombing and torpedo plane. It is fitted with a 360-h.p. Rolls-Royce engine, but provision is made for the installation of an engine of greater horse-power when so desired. Its total weight is 5,300 lb., with a military load of 220 lb. In its general method of construction it is similar to Type "Wu," except that the two floats are supported on separate and independent structures with clear space between them to permit a torpedo to be slung under the fuselage and launched without hindrance.

Provision is made for two cockpits and a cabin in the fuselage. The pilot's cockpit is under the trailing edge of the upper wing, where there are two side-by-side seats. Behind this is the gunner's cockpit. Between the pilot's cockpit and the engine compartment is the cabin for the bomber. This is built of generous dimensions with a trap door and bombing gear installed.

When used for passenger carrying, four persons can be comfortably accommodated in the cabin, the head room of which is sufficient for persons of normal height to stand upright. Entrance to the cabin is effected by a door on each side of the fuselage, while a third or emergency door is fitted on the roof. Large windows are fitted on both sides of the cabin, affording exceptional vision.

When long-distance non-stop flights are to be made, one or more large reserve fuel tanks can be installed in the cabin. The normal cruising range is six hours. Overall dimensions of the machine are: Span, 46 ft.; length, 36 ft. 9 in.; and height, 17 ft. 4 in.

Type "Chiang Hung" (1930).—This is a two-seat training or three-seat touring biplane. Its characteristics, specifications and performance data are as follow:—

Wings.—Single-bay biplane. Wooden structure with wire bracing. Fabric covering. Ailerons fitted on bottom planes only. Interplane struts are steel tubes with wood fairings. Means are provided on top centre section for hoisting.

Fuselage.—Rectangular structure of wood-covered fabric. Engine mounting and forward portion of fuselage of steel tubing.

Tail Unit.—Monoplane type, with braced three-ply tail plane and cantilever fin. Tail plane adjustable in the air. Unbalanced rudder and elevators. Wood structure and fabric covering.

Floats.—Twin floats, with single steps. Chassis consists of outwardly sloping "N" struts to floats. The floats are connected together by two spreaders which are supported midway by the apices of transverse Vees from the fuselage. The spreaders are further cross-braced with cables. All the float struts are steel tubes faired with wood. Floats made of wood, with five watertight compartments, each with hand-hole.

Power Plant.—One 165-h.p. Wright "Whirlwind" 5-cylinder air-cooled engine. Two fuel tanks on top centre section. Oil tank behind engine on top of fuselage.

Accommodation.—Front cockpit with side-by-side seats below wing. Rear cockpit behind trailing edge. Dual control is fitted in the front cockpit. When the machine is used for touring the rear cockpit can easily be converted into a luggage compartment with detachable cover.

Dimensions.—Span (top), 34 ft. 7 in.; span (bottom), 35 ft. 8 in.; chord, 5 ft. 3 in.; gap, 5 ft. 3 in.; length, 27 ft. 4 in.; height, 11 ft. 8 in.; wing area, 338 sq. ft.

Weights and Loadings.—Weight, empty, 1,630 lb.; disposable load, 2,600 lb.; wing loading, 7.7 lb./sq. ft.; power loading, 15.75 lb./h.p.

Performance.—Maximum speed, 110 m.p.h.; landing speed, 53 m.p.h.; initial rate of climb, 514 ft./min.; climb to 10,000 ft., 31 min.; absolute ceiling, 15,500 ft.

Type "Chiang Hau" (1932).—This is powered with a Wright "Whirlwind" J-6-5, 165-h.p., at 2,000 r.p.m.

Performance with Full Load.—High speed, 118 m.p.h.; cruising speed, 97 m.p.h.; landing speed, 56 m.p.h.;

rate of climb at sea-level, 450 ft./min.; climb in 10 min., 3,770 ft.; service ceiling, 9,620 ft.; wing loading, 10.1 lb./sq. ft.; power loading, 14.9 lb./h.p.; cruising radius, 715 miles.

Dimensions.—Length overall, 27 ft.; height overall, 10 ft. 10 in.; wing span, upper, 32 ft. 2 in.; chord, upper wing, 4 ft. 4 in.; wing span, lower, 32 ft. 2 in.; chord, lower wing, 4 ft. 4 in.; dihedral, upper wing, 3 deg.; dihedral, lower wing, 4 deg.; incidence, upper wing, 1.5 deg.; incidence, lower wing, 1.5 deg.; tail incidence, adjustable in flight, 2.5 to + 2.5 deg.

Areas.—Wing, including aileron, 245.2 sq. ft.; total aileron, 21.0 sq. ft.; tail plane, 13.1 sq. ft.; total elevator, 12.3 sq. ft.; fin, 5.0 sq. ft.; rudder, 7.6 sq. ft.; wing section, R.A.F., 34.

Weights.—Weight, empty, 1,660 lb.; useful load, 880 lb.; pilot, 140 lb.; oil (7 gall.), 53 lb.; pay load, 175 lb.; fuel (72 gall.), 432 lb.; gross weight loaded, 2,260 lb.

Equipment.—Propeller (metal, adjustable), diameter 8 ft. 6 in. Control (dual), conventional stick and rudder bar.

Instruments.—Compass, Bank Indicator, Airspeed Indicator, Altimeter, Tachometer, Petrol Gauge, Oil Pressure Gauge, Oil Temperature Gauge.

Floating Hangar.—Besides all the hangars and slipways which are used for housing and operating aircraft and which are designed by the officers of the N.A.E., a steel floating hangar which is unique in the fact that it is the only one of its kind in the world, was constructed at the Kiangnan Dock and Engineering Works in 1922. It was designed by Captains Barr and Wong on the principle of floating docks, and was for use on the Yangtsze River. Its chief features are its mobility, as it may be towed anywhere, and its ability for anchoring in shallow waters. Unlike the use of shore hangars and slipways, the seaplane housed in the floating hangar can be launched and flown in a very few minutes' time, and is therefore independent of the tide.

The hangar structure is built on to a hull which consists of two longitudinal steel pontoons held together by transverse girders and deck plating. Each pontoon is divided into five watertight compartments; the centre one is the flooding compartment and the other four holds and chain lockers. In the centre of the hull there is a trough or dock in which the floats of the seaplane normally rest. At the front end of the trough there is a hinged flap door which, when closed, is watertight. When the seaplane is not in use the hull rests at its normal waterline, the flap door is closed, and the bottom of the trough is above water.

When it is desired to operate the seaplane, water is pumped into the flooding compartments, and the hull is sunk to its low waterline; the flap door is then opened and the machine is water borne, and hence can easily be taxied out. Sinking or floating of the hangar is accomplished by means of a centrifugal pump driven by a kerosene engine. Overall dimensions of the floating hangar are: Length, 70 ft. 8 in.; width, 35 ft. 4 in.; and height, 26 ft. 6 in. Its normal draft is 2 ft. 10 in.

In February, 1931, the N.A.E. was moved to Lungwha, Shanghai. Capt. Y. K. Tseng is now Director-General of the reorganised Naval Air Establishment.

Because it has religiously kept out of politics, the N.A.E. has weathered and survived a number of revolutions and the downfall of several different governments. Its development, however, has been hindered by the paucity of available funds.

Recently, the Curtiss-Wright interests have effected a deal with the Chinese National Government, and is at work establishing a factory for the manufacture of American-type aircraft. This, however, will not interfere with the N.A.E., whose primary purpose is research and experimentation with Chinese raw materials for use in aircraft construction. [Nevertheless, this should provide food for thought for British constructors with a view to establishing themselves also in a promising market.—ED.]

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adjustments were made. This test was carried out at the instigation of Maj. F. B. Halford, the designer. During the test the engine was mounted on a rigid engine stand which, by concentrating all loads and vibrations in the engine itself, represents a greatly more severe trial than a run of 100 hours at full throttle in a machine.

Severe test for "Gipsy Six"

THE new "Gipsy Six" engine, which was described in FLIGHT for January 25 of this year, has recently been put to a severe test at the D.H. works. It was run for 100 hours at full power, and at the maximum revolutions of 2,350 r.p.m., during which no replacements or

A VISITOR FROM AUSTRALIA

DN Thursday morning, at about 11.45 a.m., *Horatius* flew in to Croydon from Paris, and among the passengers was Mr. (he has been a captain, but he prefers to be called Mister) F. W. Haig, A.F.R.Ae.S., the chief aviation officer of the Vacuum Oil Co. of Australia. He has been despatched by his firm to study the systems of civil flying in other countries, and the Minister of Defence, Sir George Pearce, has specially asked him to give him a report on his return about any points which might be of use to Australian civil flying.

Mr. Haig was once an associate of another Australian, the late H. G. Hawker. During the war he was an officer of No. 1 Australian Squadron, and was taken prisoner by the Turks near Amman. Afterwards he was chief pilot of Quantas. He has spent six weeks getting here from Melbourne, having travelled by air lines of various countries as well as by boat and train. At the luncheon given by Mr. Gordon England and the Vacuum Oil Co. to welcome him at Croydon, he said that he had worn the same suit for the six weeks, and he was afraid of its disintegrating at any moment, but it was made of good Australian cloth held together by cotton spun in England, and the combination was a good one. Up to the present he said that he did not know how he would justify his trip to his firm, as the organisation of Australian air lines was so good that he had not noticed any useful points on his tour which would go to improve them. But he would make further inquiries, as he was to go on a tour of Europe in the Vacuum Oil Co.'s "Dragon."

Mr. Haig gave a very good account of civil flying in Australia. The Government, he said, was very sympathetic, and he described the adoption of the report of the special committee which sat last year as putting air trans-

port on the same footing as rail transport, and so adding to its prestige.

The population of Australia was about 6½ millions, and the total defence vote was 3½ million pounds. Last year the airways carried 40,000 paying passengers. He would like to know how this compared, as a proportion of population, with the passengers carried in this country. The Australian airways flew 23,000 miles a week. The subsidised air routes totalled 5,000 miles, and 1,600 miles were flown under agreement with the Post Office, which paid 8s. per lb. for mail carried. The subsidy to the aero clubs had been renewed. They got £20 per pilot trained and £10 per licence renewed. If a club flew 600 hours in the year it received £300, or *pro rata* for less time. £3,000 had been allotted for the help of un-subsidised flying concerns, and it was being distributed wisely. For instance, one firm which flies between Sydney and the little town of Bega gets 6d. a mile, and as "Fox Moths" are used, that enables the town of Bega to retain its air link with the capital. He said that the associated aero clubs of Australia had asked him to convey their greetings to the flying clubs of this country.

As regards the tenders for the Singapore-Darwin route, the date for closing which was January 31, he believed that in addition to the tender from the Imperial Airways-Quantas combine, there would be tenders from the Larkin firm, New England Airways, and a combine of West Australia Airways with Sir C. Kingsford Smith and Mr. Ulm. If the Quantas tender was accepted, he thought the service would be able to start right away, but if another tender were accepted, there would be a delay while new aircraft were ordered. In any case, he thought that the service would start not later than next November.



AT BUCKINGHAM PALACE

DN February 27 H.M. the King held an Investiture at Buckingham Palace, when the following were amongst those in attendance:—Air Marshal Sir Robert Brooke-Popham (Principal Air Aide-de-Camp) and Group Capt. Roderic Hill (Aide-de-Camp in Waiting). Amongst those invested by His Majesty with the Insignia of the respective Divisions of the Orders into which they have been admitted, were the following:—

ORDER OF THE BATH

(*Civil Division*)

Received the Honour of Knighthood, Knight Grand Cross.—The Lord Weir.

(*Military Division*)

Companions.—Air Commodore Charles Breese, R.A.F., and Group Capt. Reginald Bone, R.A.F.

ROYAL VICTORIAN ORDER

Knight Commander.—Sir Richard Glazebrook.



Death of Lord Sempill

LORD SEMPILL, a distinguished soldier who commanded the 8th Battalion of the Black Watch during the War, and a Representative Peer for Scotland for the past 24 years, died at his Fintry House, Aberdeenshire, at the age of 70, on Wednesday, February 28. The funeral took place at St. Meddens Church, Aberdeenshire, where the service was taken by the Bishop of Aberdeen and Orkney, on Saturday, March 3. The Master of Sempill, who succeeds to the Peerage, is well known in aviation circles throughout the world. He entered the Royal Flying Corps in 1914 and became a Colonel in the R.A.F. when he was only 25 years of age. He has been a private owner of aeroplanes for a great number of years and has ever been to the fore where hard work has been required to establish aviation concerns. It will be recalled that he has only recently recovered from a serious accident in the U.S. when riding a new type of three-wheeled motor car after flying to that country in the *Graf Zeppelin*. His work as President of the Royal Aeronautical Society, although undertaken during a most difficult period, was an outstanding success, and in that capacity, as well as subsequently, he has done a very great deal to foster the good relationships between those in aviation at home and abroad.

DISTINGUISHED SERVICE ORDER

Received a Bar to the Order.—Sqd. Ldr. Matthew Frew, R.A.F.

His Majesty then conferred Decorations as follows:—

MILITARY CROSS

Flt. Lt. Claude Pelly, R.A.F.

SECOND BAR TO THE DISTINGUISHED FLYING CROSS

Sqd. Ldr. Stafford Harris, R.A.F.

DISTINGUISHED FLYING CROSS

Flt. Lt. John Bradbury, R.A.F., and Flt. Lt. John Grayhill Thomas, R.A.F.

AIR FORCE CROSS

Flt. Lt. David Anderson, R.A.F.; Flt. Lt. Oliver Carter, R.A.F.; Flt. Lt. Leonard Snaith, R.A.F., and F/O. Singleton Richards, R.A.F.



"Les douze heures d'Angers"

THIS year the 12 hours' reliability trial organised by the French Aero Club de l'Ouest has been made international in character as a result of the success which attended last year's national contest. Machines must be at least two-seaters, and the weight of two occupants must equal 160 kg., or ballast carried to bring the weight up to that figure. Engine capacity is limited to 8 litres (488.19 cu. in.), and contest consists in covering the greatest distance in 12 hours over a closed circuit. Entries must be made to the Aero Club de France, 6, Rue Galilee, Paris, before April 1 at a fee of 500 francs, or up to May 1 at an increased fee of 750 francs, or up till June 1 at the double fee of 1,000 francs. The contest is scheduled to take place on July 8.

Japanese Civil aviation vote

SIX million yen have been voted by the Cabinet Council of Japan for the development of civil aviation. Twenty-one aerodromes will be established, and the production of aircraft thoroughly studied.

French air attaché in Moscow

CAPT. DONZEAU has been appointed Air Attaché to the French Embassy in Moscow.

FROM THE CLUBS

THE NORFOLK AND NORWICH AERO CLUB

A very large number of club members attended the annual dinner held at the Arlington Rooms, Norwich, on Friday, March 2. After the Chairman (the Lord Mayor of Norwich, Alderman F. C. Jex, J.P.) had proposed the "Loyal Toast" the President of the Club (Alderman H. N. Holmes, J.P.) presented his trophy for cross-country flying to Mr. Alan Coleman.

The Lord Mayor proposed "The Health of the Norfolk and Norwich Aero Club," and in doing so said that the Norwich Corporation were lucky to have such a prosperous club, as they got a very great deal of reflected glory from it. He recalled that it was two members of the Corporation, Messrs. C. R. Bignold and Capt. A. A. Rice, who were responsible for starting the club in 1927; also the club was indebted to a very great extent indeed for help in many directions from Alderman Holmes. He said that eleven "A" licences were gained last year, four of them by ladies. He reminded those present that the aerodrome was now a municipal one and was being run for the Corporation by the club, and he hoped that it would become the airport it ought to be. He confessed, to his shame, that he had never left the ground, but that he hoped to fly before the summer was through. He also said that the municipality had been in touch with the railways, with Imperial Airways, and K.L.M., in an endeavour to see that Norwich was not left out of the schemes of air organisation now maturing. In conclusion, he hoped that the time would never come when the airport need be used for any other purpose than that for which it was planned.

Capt. A. A. Rice, replying to the toast, thanked the Lord Mayor on behalf of the club, and recounted that the actual start of the club occurred in the Mayor's parlour. With regard to future developments, he announced that the club had also been in touch with Imperial Airways and the railways, and that it would do its best to see that the city was kept to the forefront of aeronautical development.

Alderman H. N. Holmes, proposing the toast of "The Visitors," extended a hearty welcome to those present. He regretted exceedingly that Col. Shelmerdine, the Director of Civil Aviation, and Mrs. Shelmerdine had found it impossible to be present. He also had to say that another guest, who was to have taken Col. Shelmerdine's place, had at the last minute wired to the effect that he would not be present. He was pleased, however, to feel that they had someone, in the person of Air Commodore R. H. Verney, who had specially flown over, in spite of the murky weather, to attend the dinner, and who would reply to the toast.

Air Commodore R. H. Verney said that the job of replying to this toast had been sprung upon him rather suddenly, as it was only at 3.30 p.m., on his arrival at the aerodrome, out of the mist, that he was met by Capt. Rice, who asked him if he would do so. He thanked the club on behalf of the guests for the very excellent dinner and paid tribute to the keen spirit of the club, a spirit which was exemplified by the fact that, despite the atrocious weather, he found on his arrival a lady member being given tuition by the club's chief instructor, Mr. Collier. This was, he thought, a fine example for others. He hoped that all the talk about air lines and preposterous commercial undertakings of that nature would not in any

way lessen the keenness of private individuals for flying, because that was what was really wanted in a flying club.

After dinner, dancing was continued until the early hours to the tune of Percy Cohen's Band.

On Friday, March 23, at 8 p.m., a lantern lecture will be given on "Norfolk Archaeology from the Air" at the clubhouse. This is being arranged under the joint auspices of the club and the Norfolk and Norwich Archaeological Society. During last summer the club took many air photographs of archaeological sites in the county, and Prof. D. Atkinson, F.S.A., will be using these as the basis of his lecture, which will be open to the public. Tickets are 2s. each, and may be obtained from the Club Secretary; The Norfolk and Norwich Library; or Gooses, Ltd., 2, Haymarket, Norwich.

Mrs. F. Crossley, who returned to Norwich last weekend, received some refresher instruction from Mr. J. Collier before going solo. Other soloists last week were Messrs. A. R. Cox, H. C. Stringer, A. Kirkby, S. Hansel, A. J. S. Morris and Flt. Lt. J. Fogarty. Mr. H. Stringer flew a passenger to Ipswich.

HATFIELD

The London Aeroplane Club flew 28 hr. 10 min. last week, the total flying for the month of February being 156 hr. 20 min. There was one new member, Mr. F. E. Townson. The flying times of the R.A.F. Reserve totalled 53 hr. 25 min. and those of the R.A.F. Reserve Flying Club 10 hr. 55 min. Mr. L. P. Williams, of the British and Dominion Films, completed his "A" licence tests on the Stage and Screen Aero Club machine. Messrs. Goldsmith, Matusch and Place, who are private owners, have been in the air most of the week. Visitors to the aerodrome included Messrs. Goodyear, Browning and Stranger in "Moths," Mr. Pearce in a "Puss Moth," and Mr. Armstrong-Evans in a Miles "Hawk." Arrangements are being made for riding and hacking lessons to be given at the aerodrome, providing sufficient members are interested. The Swimming Pool is to be opened at Easter, weather permitting. Two squash matches have been played during the week, both of which were won by the Hatfield Club. On Thursday, March 1, a snooker match was played against the Engine Shop at Stag Lane, the losers paying for a mutton supper. Hatfield had a free supper.

LIVERPOOL AND DISTRICT AERO CLUB

Flying returns for the week ending March 2 totalled 19 hr. 25 min. dual, 25 hr. 45 min. solo and 2 hr. 55 min. night flying. The total time for February was 168 hr. 30 min. Night flying took place on one night under ideal conditions, two members making successful first solos.

BROOKLANDS

The weather during the week has been cold with considerable fog, so that members waiting to take their "B" licence tests have been unfortunate. The total flying hours for the week were 19 hr. 30 min. dual and 17 hr. 15 min. solo. Mr. G. Farquharson has completed his instructors' course and successfully passed his tests. New members, who joined during the week were Messrs. Chambers, Vivian, Howitt and Gratten. The members and staff of the Club have formed a cinema club, so that a complete record of members can always be shown on the screen; Mr. Arthur Woods, from the British International Pictures, will be in charge. The G.Q. Parachute Co. have put two pupils

through their first drops, the G.Q. parachutes, which are available through the Sales Department, descending very steadily. John Grierson has returned from his trip to Russia; his "Moth" is now quite a study with its details of many unique flights.



A "HAWK" FOR IRELAND: Phillips & Powis have just delivered this "Hawk" to Lady Nelson, of Everson Flying Services, Finglas. With the machine are Mr. J. R. Currie, chief ground engineer of the company, and Capt. Hamilton, who learnt to fly at this school.

A GUERNSEY GLIDER: The "Scud I" which is used by the Guernsey Gliding Club at St. Peter Port. The club propose to build a similar machine.

YORKSHIRE AEROPLANE CLUB (N.F.S.)

Club flying totalled about 9 hr. during the week, and the total flying for February 33 hr. The only visitor during the week was Mr. R. R. Bentley in a Comper "Swift."

SOUTHERN AERO CLUB

The flying hours for the month of February totalled 27. New members were Messrs. R. F. Burgess, C. J. Rhind, R. K. C. Norwood and G. K. MacLean. Mr. MacPhee, who is a temporary member, took advanced instruction on the Avro 504 K. Visiting machines included a three-seater Miles "Hawk" flown by its designer, a three-seater Avro "Club Cadet" flown by Mr. Thorn, and a "Leopard Moth" flown by Capt. Findlay. On February 7 a most successful dance was held at the Regent, Brighton, about 200 members and guests being present.

CARDIFF AEROPLANE CLUB

Flying times for the week totalled 11 hr. 25 min. dual, 9 hr. solo and 1 hr. 5 min. tests. There was one new Associate member, Mr. D. King. Mr. W. G. Nicol took delivery of his Klemm "Swallow" fitted with a British Salmson engine, on Saturday, March 3. Mr. Hordern, of British Klemm, spent the week-end at Cardiff with the demonstration "Swallow." Eight members flew this machine and were greatly impressed with its simplicity.

BRISTOL AND WESSEX AEROPLANE CLUB

The flying time for the month of February amounted to 121 hr. 50 min., an increase of 30 hours compared with February of 1933. There are two new pilot members, Messrs. W. P. N. L. Ditmas and R. Mauder. The Racing Committee of the Royal Aero Club have allotted the S.B.A.C. Challenge Trophy for competition at the Bristol and Wessex Club Garden Party on July 28. It is probable that the competition will take the form of a race over a closed circuit. Western Airways ran three special services with a D.H. "Dragon" between Bristol and Castle Bromwich for the British Industries Fair, calling at Gloucester en route.

HANWORTH (N.F.S.)

Flying time for the week totalled 24 hr., and for the month of February 126 hr. Mr. Walters has passed his test in meteorology and navigation and is now a fully qualified "B" licenced pilot. On Thursday, March 1, Mr. I. Ramsay and Mr. Tweddle flew to Birmingham in a club machine to visit the British Industries Fair; Mr. J. E. D. Holder accompanied them in another machine. Another dinner and dance is to be held shortly at the club, the date will be announced later.

CINQUE PORTS FLYING CLUB

The early part of the week was spoiled by fog, but during the last three days the total flying was brought up to 23 hr. 40 min. New members include Messrs. E. A. H. Peat, C. A. Wilson, T. A. S. Webb and G. M. Hall, the latter being an associate member. Mr. Gogte is in the process of putting in night flying; he intends to put in at least 5 hr. before leaving Lympne. Messrs. G. Fellows and Luttmann have been showing great keenness by turning up in the morning with the ground staff in order to learn correct maintenance.

GUERNSEY GLIDING CLUB

The Guernsey Gliding Club has now acquired the lease of premises in the town of St. Peter Port, which will be used as lecture room and workshop by members. It is proposed to build another glider to the same design as the "Scud I" which was recently purchased. The rapidly increasing membership has made it essential that more accommodation for practice flights should be available. Meanwhile the existing "Scud I" is being worked hard and several members have already qualified to take the air after completing the requisite number of ground shoots. Messrs. Noel, Le Lachur, Siedeman, Mallet and Wheadon have made flights from the temporary aerodrome



on the golf links which give plenty of scope for the study of air currents owing to their proximity to the sea.

THE LANCASHIRE AERO CLUB

In spite of fog in the Manchester district during the week ending February 25, flying hours have shown a marked increase. Messrs. Taylor and Voorsanger have started blind flying courses which should prove useful on the ground as well as in the air during foggy weather. On Saturday, February 24, a well-attended dance was held in the Club ballroom at Woodford. Visitors to Woodford during the last week included Sir John D. Siddeley and Mr. S. A. Thorn, who has come to Liverpool to look after the interests of Messrs. Henley's and Birkett's Air Services.

FROM EGYPT

The Misr-Airwork Flying School at Cairo despatched a formation flight of three "Moths" to Luxor at 6.30 a.m. on February 7, under the leadership of the chief instructor, Mr. Carroll. One machine was piloted in turn by Prince Omar and Mr. N. Fresco, and the other two by Hussein Foda and Mr. Carrell, each with a passenger. *En route* the formation landed at Matar Shusha for breakfast and refuelling, and afterwards at Assiut for refuelling, arriving at Luxor at 11.20 a.m. After sightseeing at the Tombs of the Kings, the party spent the night at the Winter Palace Hotel. The following day they left Luxor at 10 a.m., landed at Assiut for lunch and at Matar Shusha for refuelling, and arrived at Almaza at 3.30 p.m., exactly to schedule.

GLIDING IN EGYPT

An interesting job is now in progress in the workshops of Misr-Airwork at Almaza Airport. Mohamed Taher Pasha, Vice-Chairman of the Company, who takes a great interest in motorless as well as "power" flying, has instructed Misr-Airwork to make an airworthy glider out of the damaged remains of a "Prüfing" and a "Zogling." Another repaired glider, a "Professor," has just been delivered to Mr. Marlia, of the Cairo Gliding Club, and was successfully flown at the week-end of February 3.

THE DELHI FLYING CLUB

The flying hours for the last quarter of 1933 are well below those recorded for the same quarter of the previous year. Various causes are responsible for this. On Friday, October 13, one machine was crashed, and it was very bad luck that this should be due to a moderately experienced pilot under training being caught in a sudden dust storm. At the end of September the Club was informed that the Government had decided to loan VT-ACO, the ex-air mail machine, to the Northern India Flying Club at Lahore. It was understood that this machine should become the property of the Club, and this loss has severely handicapped flying. It is sad to learn that the Viceroy Cup Race will not be flown near Delhi this year, but round a course starting and finishing at one of the main ports. Messrs. P. H. J. Campion and W. T. Pitt successfully passed tests during November for "A" licences. On December 4 a farewell dinner was given to Capt. Riley at the Rosanara Club. Sir Frank Noyce was present and presented Capt. Riley with a replica of the Viceroy's Challenge Trophy from the members of the Delhi Flying Club, as a memento of their appreciation of his work for the Club. During the evening it was discovered that Capt. Riley's initials spelt the word "Air," which was considered very suitable.

BOMBAY FLYING CLUB

A new "Gipsy Major Moth" has been ordered by the Bombay Flying Club, and in addition the Club is assembling another aeroplane with new parts ordered from Karachi.

AIR TRANSPORT & COMMERCE

AIR SERVICES IN THE PHILIPPINE ISLANDS

We are indebted to *Shell Aviation News* for the following information concerning commercial air transport in the Philippine Islands, which we think may be of interest.

The geographical configuration of the Philippine Islands offers ample opportunity for the successful operation of an air line. The Iloilo - Negros Air Express Co. Inc. was the first to take advantage of this, and since its inauguration in February, 1933, has operated the following services with Stinson aircraft (three 240 h.p. Lycoming):—

MANILA - ILOILO.—Departures from Manila on Mondays, Wednesdays and Fridays at 13.00, 08.00 and 13.00 hours respectively. Departures from Iloilo on Mondays and Tuesdays at 08.00 hours, and on Thursdays at 12.45 hours.

MANILA-BACOLOD.—Departures from Manila on Mondays and Fridays at 13.00 hours. Return trip leaves Bacolod at 07.30 hours on Mondays and Tuesdays.

ILOILO-NEGROS.—Two trips are made to Bacolod every day and two trips to La Carlota every weekday; on Sundays only one is made. On Saturdays a service is run to Fabrica.

The fares are as follows:—Manila to Iloilo, pesos 49.00 (£5); Manila to Cebu, via Iloilo, pesos 55.00 (£5 13s.); Manila to Zamboanga, via Cebu and Iloilo, pesos 95.00 (£9 15s.); Iloilo to Zamboanga, via Cebu, pesos 50.00 (£5 2s. 6d.); Iloilo to Cebu, pesos 20.00 (£2); Cebu to Zamboanga, 45.00 (£4 12s. 6d.). A discount of 10 per cent. is granted on return tickets.

Last September the company extended its activities by opening a service from Manila to Zamboanga, via Iloilo and Cebu, which is run to the following time-table:—

Wednesdays.—Manila, dep. 0.8.00, Iloilo, arr. 10.45, dep. 12.15; Cebu, arr. 13.10, dep. 13.25; Zamboanga, arr. 15.55.

Thursdays.—Zamboanga, dep. 08.00; Cebu, arr. 10.30,



The Philippine Islands.

dep. 10.45; Iloilo, arr. 11.40, dep. 12.45; Manila, arr. 15.36.

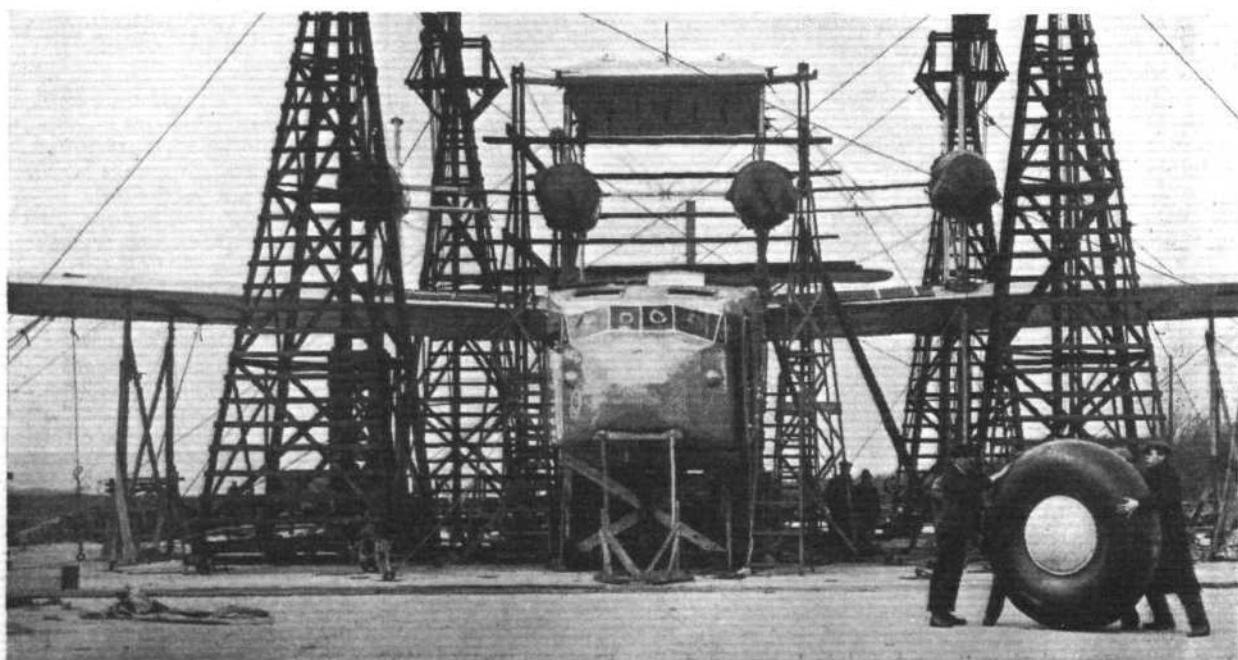
The following statistics, covering the operation of the company from February to November, 1933, may appear exceptionally high, but, in addition to the regular services, numerous sight-seeing trips have been made:—Passengers carried, 13,332; miles flown, 148,610; flying hours, 1,351.

Quite apart from the Iloilo-Negros Air Express Co. another large concern owns and operates aircraft commercially—the Philippine Aerial Taxi Co., which was formed in 1930. The first machines arrived in 1931, and since then a considerable amount of work has been successfully undertaken, particularly on sight-seeing trips and special charters, with the following results:—

	1931	Jan.-June	July-Sep.	Oct.-Dec.
Passengers carried	200	800	214	269
Hours flown	600	802	121	164
Mileage	—	70,335	9,732	13,120

TATA AIR MAIL SERVICES IN 1933

FOR the year 1933, Tata Sons, Limited, Aviation Dept., can again announce a hundred per cent. regularity on the Karachi-Bombay-Madras Air Mail Service. During the year 138,600 miles were flown on regular mail flights and 10.48 tons of mails were carried. In addition, 109.56 freight ton miles were flown during this period. Although the service is primarily a mail service, passengers are carried on request, and during the year a number of people travelled by the line. Apart from air mail operations, several special charter flights were made, two of which are worth mention. On one, two prominent business men made a tour of Northern India, covering a distance of 3,500 miles. The other flight of note was the special charter of a machine by *The Times of India* for a tour of the area affected by the recent earthquake. On this occasion a machine left the ground at half an hour's notice and the special correspondent deputed by the journal was able to visit the earthquake area and return to Bombay, having covered approximately 2,300 miles in 20 hours' flying. The results achieved by the Aviation Department of Tata Sons are good propaganda for air transport. This is the second time they have been able to announce twelve months' operation of the air mail without a delay. Such results, in spite of the lack of wireless and emergency landing grounds, and considering the bad weather conditions during the monsoons, reflect credit on the management and staff:



OUT IN THE OPEN: Erecting the Short "Scylla" at the new aerodrome, Rochester, where no hangars have yet been built. The work of building the hangar and erecting the machine are proceeding simultaneously. The men holding the Dunlop wheel give an idea of the size of the "Scylla," which is the first of a batch of machines being built for Imperial Airways, Ltd. (FLIGHT Photo.)

the more so when one considers the modest organisation and equipment and the resulting economy with which the service is operated. Distances in India are so large that one is apt to regard the Karachi-Madras route as quite small. Remember that the Tata Line is as long as an air line between London and Constantinople! As successful pioneers, Tata's deserve the thanks of the public of India. Their air line has proved itself, and well deserves the slogan: "As regular as the Tata Air Mail."

THE MADRAS-CEYLON AIR CONNECTION

News from Ceylon says that a site for an aerodrome has been chosen at Ratmalana, about 10 miles from Colombo, and consequently it was expected that the service from Madras would be opened either in March or April.

RHODESIAN & NYASALAND AIRWAYS, LTD.

DETAILS of an aviation development scheme which the South Rhodesian Government proposes to subsidise have now been made known. The plan, which was originated by Sir Drummond Chaplin through the Beit Trustees, but which has been amended by the Government in several particulars, provides for additional air mail and passenger services within Rhodesia and neighbouring States. Rhodesian & Nyasaland Airways, Ltd., has been formed by the Beit Trustees, Imperial Airways and the old Rhodesian Aviation Company. A certain number of shares was given to the latter company in exchange for the shares they held, and a Government subsidy will be granted on condition that 5,000 shares in the new company are offered to public subscription. It is intended that these shares will be held only by British subjects in the territories covered by the air services. The present Salisbury-Gatooma - Queque - Gwelo - Bulawayo - Pietersburg - Johannesburg service will be run once weekly in each direction, and a start will be made as soon as possible with the Salisbury-Blantyre service, which will also be run once weekly in each direction. Other proposed services will be from Salisbury to Beira, via Umtali (twice weekly in each direction) and Salisbury to Lusaka (once weekly in each direction). Special charter work will be continued, and provision will be made for the tourist traffic from Johannesburg to Victoria Falls and Zimbabwe. The new company has taken over the business of Christowitz Air Services, Ltd., of Blantyre.

MORE IMPERIAL AIRWAYS SERVICES IN AFRICA

DURING the next few weeks the Imperial Airways services between Salisbury and Johannesburg will be duplicated. This will mean that two services a week will be

operated. The main service is so often occupied with "through" traffic that local services must be operated with additional machines. D.H. "Hercules" aircraft are being employed.

THE K.L.M. SPRING SERVICE

On March 1, as part of their spring service, the K.L.M. introduced a new early morning service between Schiphol, Waalhaven and Croydon. Leaving Schiphol at 7 a.m. and Waalhaven at 7.35 a.m., the aeroplane arrives at Croydon at 9.15 a.m., and passengers are in central London by 10 o'clock. In the other direction an express service London-Amsterdam leaves Croydon at 7 a.m. and arrives at Schiphol at 9.10 a.m., with a connection to Rotterdam arriving Waalhaven at 9.55 a.m. The evening service Amsterdam-Rotterdam-London, hitherto operated only during the summer months, also commenced on March 1 as part of the spring service: depart Schiphol 6.30 p.m. and Waalhaven 7.5 p.m., arriving Croydon 8.30 p.m. The journey time from Rotterdam to London is thus reduced to 1 hour 45 minutes (actual time 1 hour 25 minutes). For the first time the spring service will include three aeroplanes on the Amsterdam-Rotterdam-London route during the middle of the day.

GERMANY-SOUTH AMERICA IN FOUR DAYS

THE mail carried on the second of the twice-monthly postal services of Deutsche Luft Hansa left Germany on February 17, and reached Natal, Brazil, its destination, on Tuesday, February 20. Thus the schedule time was cut down by a day.

GERMANO-POLISH CONVENTION RATIFIED

THE Germano-Polish aeronautical convention became effective on March 2. Preparations for a service between Berlin and Warsaw are being made, but so far no date has been fixed for the inauguration.

CANADIAN RAILWAY-AIR SERVICES SUCCEED

SUCH success has attended the inauguration of railway and air services in which the Central Vermont Railway, a subsidiary of the Canadian National Railways has co-operated for the past three months, that it has been decided to extend rail-air travel to include ten northern New England cities, in Vermont, New Hampshire, Maine and Massachusetts. The decision has been taken after an experience which has included such abnormal conditions as temperatures down to 45 deg. below zero, and snowfalls which left the ground covered with snow from two to three feet deep. No difficulty has been experienced in starting the three-engined aeroplanes even in the coldest weather.

CIVIL AVIATION IN SOVIET RUSSIA

(From a Correspondent)

THE extent to which civil aviation has developed in Soviet Russia in recent years may be judged from the fact that at the beginning of the year 1933 the length of the airways—main and branch lines—was 26,098.8 miles. The fact is the more notable when it is borne in mind that in 1923, when attempts were first made to establish a civil air fleet, the length of the airways was 994.2 miles, and in 1928, the first year of the Five Year Plan, it was 7,084 miles.

At present the country is intersected by three big main airways—from the western borders to the Pacific Ocean, from Leningrad to Afghanistan and West China, from the Arctic Ocean to the borders of Turkey and Persia. The most remote parts of the Soviet Union, such as Yakutia and Sakhalin, now have regular air communications with the cultural centres. The Soviet main airways stretch over the Siberian tundras, over the vast taigas, the hot sands of central Asia, and the mountains of the Caucasus. Safe air communications have been established between the borders and the centres of the different districts and remote regions, the big metallurgical enterprises, the coal basins, etc. Important investigations were carried out last year with a view to establishing new airways. Expeditions investigated conditions along the whole of the Behring Sea, the coast of the Arctic Ocean and the expanse from Archangel to the Ural mountains.

The growth of the airways has naturally brought about a corresponding increase in transportation by air. Whereas in 1928 the number of passengers carried by air was 7,000, in 1932 the figure had increased to 31,800, and in the first 11 months of 1933 it was over 40,000. The carriage of mail had increased from 64.8 tons in 1928 to 454 tons in

1932, and over 762 tons during seven months of 1933; goods and luggage from 85.3 tons in 1928 to 450 tons in 1932. Last year there was a considerable extension of the work of the civil aviation fleet. During eleven months of 1933 for which figures are available, the machines flew 2,221,900 miles, as against 4,349,800 miles in the whole of 1932.

But the use of civil aviation in Soviet Russia is not confined to transport only. It plays a big part in production, and is very useful in the reconstruction of agriculture. It does much valuable work in the extermination of agricultural pests from the air by means of scattering poisonous substances on infested areas. This kind of work is continually increasing. In 1925, 3,087.5 acres were thus covered; in 1928, 79 acres; and in 1932, 106,210 acres. In the extermination of the malaria mosquito aeroplanes carried out work over an area of 1,431,600 acres in 1932; in the previous year the area so covered was 274,170 acres.

The application of aeroplanes to sowing has only been recently tried, but it has been so successful that it is being rapidly extended. In 1931 the total area sown from the air was 9,880 acres; in 1932 it was 148,200 acres.

Aeroplanes are also used for the discovery and location of forest fires. In 1932, as a result of the work done by aeroplanes, 100 forest fires were speedily put out.

Aeroplanes are also used in Soviet Russia for the purpose of photographic survey. This work is very important for the country, as it facilitates land improvement, discovers new sources of water power, new centres of natural resources.

The practice of using aircraft in the different branches of the national economy has been very much extended in

1933, particularly in the field of agriculture. Aeroplanes engaged in agricultural work flew 45,000 hours during the course of the year, as against 13,000 hours in 1932. During 1933 aeroplanes scattered chemical substances for the extermination of agricultural pests and the malaria mosquito over an area of 2,924,000 acres of land, and sowed 345,800 acres of land from the air; they patrolled 51,870,000 acres of forest land, for the purpose of putting out fires, exterminating pests, etc. Civil aviation rendered invaluable service to agriculture in aerial photographic survey and in establishing air communication in outlying agricultural regions.

Mention must also be made of the use of aviation in the Arctic regions. The brilliant exploits of the pilots Chuknovsky, Babushkin, Slepnev and others will go down in the history of Arctic exploration. Soviet aeroplanes are also used in polar sea expeditions, like the expedition to the Kara Sea, and in the animal-killing trade in polar regions.

The growth of civil aviation in Soviet Russia has been directly due to the development of an aviation industry. At first only foreign machines were used on Soviet airways and foreign motors. It is only four or five years since the first aeroplanes of Soviet construction began to appear. Among these early Soviet aeroplanes were those of the Ukrainian engineer, Kalinin—the four-seater K.4 and eight-seater K.5; then came the machines of the well-known constructor, Tupolev—the nine-seater ANT.9 and others. These aeroplanes, which are continually replacing those of foreign make, have become the predominant type in Soviet civil aviation. Recently, Soviet constructors have scored a notable success in the building of the 36-seater plane ANT.14. At the end of 1931 the Soviet Union commenced to make motors for aeroplanes. This finally laid solid foundations for a Soviet aeroplane industry.

Recently the Soviet Union has commenced to construct dirigibles, which are of great importance to a country of such vast distances. Since 1931 five small airships have been built, including the semi-rigid type B.5. An airship-building yard is now in course of construction, and work is proceeding on the first medium-sized semi-rigid dirigible (of 18,500 m³), a modification of the Italian dirigibles, the Norway and Italy.

Soviet civil aviation made much progress in the year 1933, many new air lines having been opened, some of them of great economic significance. These include such important lines as the Vladivostok-Sakhalin-Kamchatka,

which is 3,107 miles long and has opened up immense possibilities for the development of transport in the Soviet Far East.

The total length of the Soviet air lines of national importance at the end of 1933 was 22,992 miles, as against 18,952.7 miles in 1932. If the length of the local lines is added, the aggregate length of the air lines at the end of 1933 was 31,691 miles. The Soviet Union now holds second world place in length of air lines, the United States of America holding the first.

Much work was carried out in 1933 in improving the civil aviation fleet by the addition of new machines, the establishment of more aerodromes, air stations, hangars, petrol depôts, radio communication, etc.

During the latter half of 1933, 42 local air-mail lines were established in agricultural areas. These lines have a total length of 6,214 miles and required the building of 164 aerodromes.

The machines of the Soviet civil aviation fleet have also rendered much help to arctic expeditions and to ships navigating the Far North. During 1933 the aeroplanes engaged in work in the Arctic flew a total distance of 144,164.8 miles; they successfully led the Kara expedition composed of thirty vessels, which had as its object the transportation of 37,000 standards of timber through the Kara Sea; they carried out an air photographic survey of the Chukotsk peninsula; they made six flights to Wrangel Island for the purpose of relieving the personnel wintering there and bringing back furs. As a result of the work carried out by the aeroplane "USSR N-2," cargo vessels made a first voyage in the estuary of the Lena River. The aeroplane had to fly day and night in uncharted regions, remaining ten days in the open sea, far removed from its base. Another interesting flight was that of the pilot, Levanevsky who, in a seaplane, the "USSR N-8," flew the route Sevastopol-Khabarovsk-Alaska-Cape Severni-Yakutsk-Irkutsk. The flight was made under exceptionally heavy weather conditions to rescue the American airman, Mattern, whose machine had made a forced landing.

Plans have been made for this year to extend civil aviation still further. The length of air lines in the Soviet Union in 1934 are to be extended to 29,827 miles, and by 1937, the end of the Second Five Year Plan, to 52,819 miles. Provisions have been made for the building of the requisite number of new machines, aerodromes and other equipment. The estimates provide for a considerable extension of all branches of work of the civil aviation fleet.

SPEED AND THE ECONOMICS OF AIR TRANSPORT

By MAJOR F. M. GREEN, F.R.Ae.S., M.I.C.E.

Lecture (abridged) delivered before the Royal Aeronautical Society on Thursday, March 1, 1934.

SOME months ago I set out to find a logical basis for determining the most economical speed of flight. I did not expect an exact solution, but I satisfied myself that I could give a general answer to most of the problems. The methods I shall discuss are engineering rather than scientific. Much of the data I shall use is the result of experience in design; many of the figures on which I base my results are derived from current practice. In all these estimates of the best speed for air transport the convenience of the passengers in saving time is entirely neglected. We will take as our unit of transport, one ton mile of pay load. The number of units of transport each aircraft can provide depends on three factors:—(a) The net pay load in tons; (b) the average cruising speed in miles per hour; (c) the number of hours flown per year.

These three factors multiplied together obviously give the maximum number of ton miles per hour possible. The actual revenue earned depends on this figure multiplied by the average rate per ton mile and by the average fraction of the maximum load carried.

(a) Of these three factors, the net pay load depends largely on the length of flight. I have for convenience considered that the range in still air is 500 miles. Net pay load means only the weight of passengers, luggage, freight and mails that earn revenue. It excludes crew, wireless and equipment generally.

(b) The average cruising speed is lower than the average air speed, on account of wind and other things. The faster the air speed, the less will this difference be. I have not attempted to assess the advantage that the faster aircraft has in this respect except to mention it helps to offset other factors mentioned later.

(c) The number of hours flown in a year is assumed to be constant. If the length of stages is fixed, the faster craft will do more journeys in the year and will spend more time on the ground in consequence. This will be balanced to some extent by the smaller loss of time due to wind.

The money that passengers are willing to pay depends on the speed, comfort, safety and punctuality of the service. No attempt is made to allow for this. I have assumed that all the aircraft considered are equal in all respects except speed, and I leave it to the operator to decide how much economy he deems it necessary to sacrifice for speed to attract fares. Few, if any, air lines can pay at present without some form of subsidy. If this is a percentage on the traffic receipts, then the analysis is unaffected. If it is paid on some other basis it must be considered on its merits; it is obviously impossible to generalise except on the former basis. If we agree with the argument so far, we come to the first conclusion of the analysis, that earning capacity is proportional to pay load \times cruising speed.

Cost of Operation

To find the profit-making possibilities of an aircraft, we need to know the relation between earning capacity and cost of working. I do not propose to give actual figures; these depend too much on the particular conditions of each route. It is enough for our purpose to know the relative costs only, and these can be estimated to reasonable accuracy in a simple way. The expense of running an air liner can be divided into two parts:—

(a) Standing charges, which include: (1) Capital charges;

Cruising Speed in m.p.h.	Cruising H.P. per 1,000 lb.	Hours of Flight	Fuel and Tanks, Percentage Gross Weight	Gross H.P. per 1,000 lb.	Weight of Motor Units	Weight Less Gross Pay Load	Gross Pay Load	Net Pay Load	Factor of Usefulness
100 .. .	28.2	5.00	8.4	62	15.5	69.9	30.1	24.1	24.1
110 .. .	33.0	4.55	9.0	62	15.5	70.5	29.5	23.6	26.0
120 .. .	39.0	4.16	9.8	62	15.5	71.3	28.7	23.0	27.6
130 .. .	46.5	3.84	10.7	62	15.5	72.2	27.8	22.2	28.9
140 .. .	54.0	3.58	11.6	72	18.0	75.6	24.4	19.5	27.2
150 .. .	64.0	3.33	12.7	85	21.2	79.9	20.1	16.1	24.2
160 .. .	75.0	3.12	14.1	100	25.0	85.1	14.9	11.9	19.0
170 .. .	87.0	2.95	15.4	116	29.0	90.4	9.6	7.7	13.1

TABLE I

(2) obsolescence; (3) aerodrome charges; (4) general office and traffic expenses; (5) part of insurance.

(b) Running costs, which include: (1) Fuel and oil; (2) upkeep of aircraft; (3) upkeep of engines; (4) inspection; (5) wages of crew; (6) part of insurance.

The standing charges depend almost entirely on the first cost of the aircraft, and this is proportional to the gross weight. It is convenient that aircraft structures and aircraft engines cost practically the same per lb., so that it does not matter if the horse-power is relatively high or low. Standing charges therefore depend on the gross weight of the aircraft.

Running costs for aircraft with the same relative horse-power also depend on weight only, other things being equal. High powered craft cost more for upkeep, as engine upkeep per lb. is more than for aircraft; also the higher-powered craft use more fuel and oil per mile. It is impossible to allow for this difference in a general way. Fuel varies in cost in various parts of the world, and it is difficult to get reliable figures for upkeep. Fortunately it is not of much importance, for I shall show later that the most economical speed of flight is obtained with engines of a horse-power that is settled from considerations of take-off and flying with one engine stopped, except that twin-engine aircraft intended to fly on one engine only need a much lower horse-power weight ratio than three or four-engine aircraft, and therefore need special consideration. Consequently the variation in the horse-power weight ratio is too small to affect our general conclusion seriously, viz., that running costs are proportional to weight.

As a first approximation, we may make the very convenient assumption that the total cost of operating an air liner is directly proportional to the gross weight. We need only make a reservation that this applies to aircraft whose weight horse-power ratio does not differ much from 15 lb. per horse-power. We have seen that the earning capacity is directly proportional to pay load \times cruising speed. If

we express pay load as a percentage of gross weight, it follows directly that the commercial value of an air liner is directly proportional to the ratio

$$\frac{\text{Percentage pay load} \times \text{gross weight} \times \text{cruising speed}}{\text{gross weight}}$$

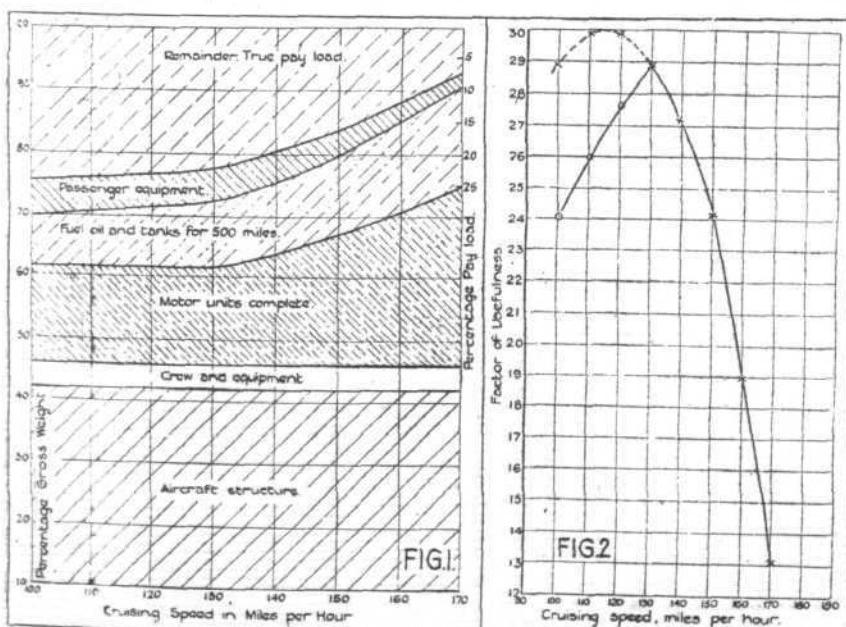
for this is the earning capacity divided by running costs. The term gross weight can be cancelled, so the commercial value of any aircraft is directly proportional to two factors—percentage pay load \times cruising speed. This I propose to call the Factor of Usefulness. Expressed another way, it is a number which when multiplied by the gross weight of the aircraft in tons, gives the work in ton miles that can be done in an hour.

Determination of Economic Speed

I have, in finding the cruising speed for which to design to get the highest Factor of Usefulness, made a number of assumptions which I believe represent the best modern practice. I have calculated the pay load for a number of aircraft of different cruising speeds, keeping the range in still air the same—500 miles. I have assumed that the aerodynamic qualities of the aircraft are unchanged by altering the horse-power of the motors, and that the efficiency of propulsion is the same. The aircraft characteristics are fairly correct for an air liner of gross weight from 10,000 to 30,000 lb.; actually the assumptions are largely based on the experience of design of aircraft of 20,000 lb. The design assumptions I have made are as follows.

Design assumptions: (1) Range in still air is constant and is 500 miles; (2) net pay load excludes crew and special passenger equipment; (3) an allowance of 25 per cent. of the pay load is added for passenger equipment; (4) wing loading is 15 lb. per square foot for a monoplane of fairly high lift coefficient; (5) span loading = gross weight/span² = 2.5; (6) parasite drag at 100 m.p.h. = 25 lb. per 1,000 lb. weight; (7) structure weight = 42 per cent. gross weight; (8) Crew and their equipment, including wireless = 4 per cent. gross weight; (9) motor units, complete with starting gear, fairing, silencers, airscrews, piping and oil coolers = 2.5 lb. per declared h.p. (Note.—“Declared horse-power” means the maximum horse-power for a 50-hour run at normal speed, and not the maximum horse-power that can be obtained. British type test horse-power is usually 10 per cent. less than maximum permissible horse-power); (10) fuel and oil at cruising speed = 0.54 lb. per b.h.p./hour. Tanks for fuel and oil = 0.06 lb. per b.h.p./hour. Total of fuel, oil and tanks = 0.60 lb. per b.h.p./hour. (11) propulsive efficiency of airscrew = 75 per cent.; (12) cruising h.p. must not exceed 75 per cent. of declared h.p.; (13) minimum type test h.p. for take-off = 62 h.p. per 1,000 lb.

These assumptions refer to a four-engined unbraced monoplane of good streamline shape. The undercarriage must either be retractable or else extremely well faired. The wing loading of 15 lb. per sq. ft. is conservative compared with modern American practice. The figure of 25 lb. drag per 1,000 lb./weight conforms with the



published performance of an aircraft of this type. The profile drag of the wings of a biplane of equally good design would be about 20 per cent. less and would probably balance the increase of parasite drag due to struts and wires. The weight of $2\frac{1}{2}$ lb. per horse-power for engine units refers to modern air-cooled radial engines and includes all accessories, based on British type-test horse-power and not on maximum power. Methods of calculating performance are too well known to need description. I wish to thank Mr. W. S. Farren for the time I was able to save by using a method he suggested to me. The horse-power needed for each cruising speed was first calculated and the weight of fuel and oil for a range of 500 miles in still air. This was debited to each hypothetical aircraft together with the weight of the power units necessary to provide the cruising horse-power at 75 per cent. of the type test horse-power. The weight of the aircraft structure and of the crew and their equipment was considered to be fixed. All these weights were given as percentages of the gross weight and the remainder is therefore gross pay load. An allowance of 25 per cent. of the gross pay load is considered to be passenger equipment and the net pay load is what is left after this has been deducted. This is shown in Fig. 1, where the results are given in a diagram which indicates how the weight of the aircraft designed for each cruising speed is split up into its components.

The next step is to multiply the net pay load by the cruising speed to obtain the Factor of Usefulness. Table I gives a summary of these calculations, while Fig. 2 shows the same result expressed as a curve. This diagram gives us the solution to our problem as to what is the economic speed of an aircraft based on our hypothetical characteristics; but it tells us something else as well. The full curve has a sharp peak at 130 m.p.h. There is also a dotted continuation which represents the Factor of Usefulness of an aircraft in which the maximum horse-power is fixed from considerations of cruising horse-power only. This dotted part of the curve is excluded by the assumption that the minimum power for take off, climb and flying with one engine stopped demands 62 horse-power per 1,000 lb. of gross weight. If we consider a twin-engined aircraft that is expected to fly on one engine only, the minimum gross horse-power must be more than for a three- or four-engined craft. The dotted part of the curve would extend more to the right of the diagram. This means that for an aircraft of this type the economic speed would be higher, but the Factor of Usefulness would be lower.

The conclusions we can make for our hypothetical aircraft are as follows:—(1) The most economic speed is 130 m.p.h. (2) The Factor of Usefulness at that speed is 28.9. (3) The minimum horse-power for safe take off, and for climb, and for flying with one engine stopped, is that which should be used for the design of an aircraft in order to obtain the highest Factor of Usefulness.

It might be argued that, since the Factor of Usefulness could be increased by fitting engines of smaller horse-power if other measures were employed to improve the take off, there is a powerful inducement to use variable-pitch airscrews, slots, variable camber and such like devices. I do not believe that this is true; the possible gain is only

from 28.9 to 30 on the Factor of Usefulness scale, which is 3.5 per cent., which would almost certainly be swallowed up by the increase of tare weight due to the devices fitted. Quite apart from this, I think that 130 m.p.h. is just about the minimum speed which operators are likely to adopt out of consideration for what I am neglecting in my analysis, namely, the convenience of the passengers. Conversely, if it is necessary to cruise at a much higher speed there must be an abundance of horse-power, and the objection to a twin-engine aircraft is largely removed. These, I think, are the reasons that have led to the adoption of such aircraft in America. We must not forget that the calculations on which we have obtained our results so far depend on a number of design assumptions. I now propose to consider what will be the result if some of our design characteristics are varied.

Influence of Height

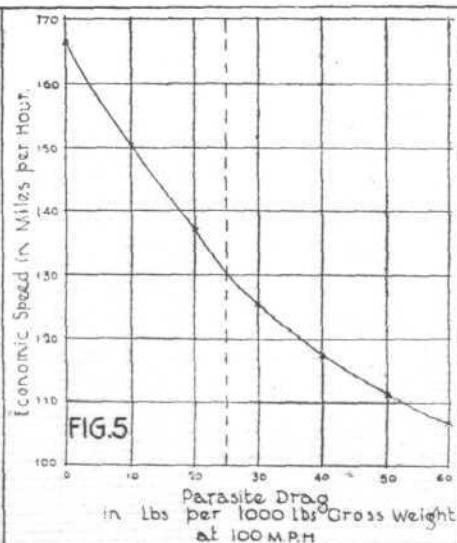
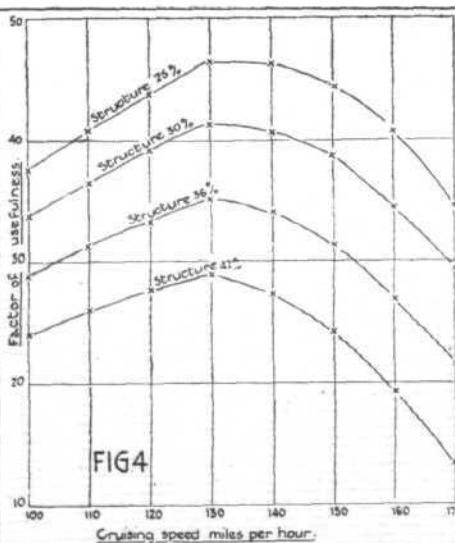
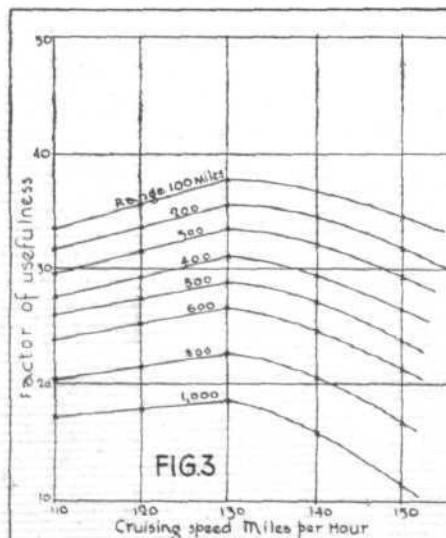
The figures given so far apply to aircraft flying in air at standard density; that is to say, at very low altitude. Mr. Tizard has already explained the advantages of flying as high as possible to obtain the best fuel economy for a given speed. The best cruising speed will be increased in proportion to the cube root of the density ratio until the engines are working at full throttle and are giving 75 per cent. of their ground type-test horse-power. This will occur at a density of 0.8 for non-supercharged engines, while the speed will be increased by 8 per cent. from 130 to 140 m.p.h. This density corresponds to a height of 7,500 ft. The use of supercharged engines will make it possible to increase the economic speed and the Factor of Usefulness still further.

Influence of Range

Altering the range alters the pay load, but it has only a slight effect on the economic speed, except for extreme ranges that we need not consider. Fig. 3 gives the Factor of Usefulness for an aircraft of characteristics similar to the former one, but for ranges varying from 100 to 1,000 miles. It will be noted that it is possible to have the same Factor of Usefulness at 150 m.p.h. as we previously had for 130 m.p.h. by reducing the range from 500 to 300 miles. At the same time, the figure for the 130 m.p.h. craft has gone up from 28.9 to 33.2. This is an improvement of nearly 15 per cent. The importance of keeping the range down is obvious, but the advantage is somewhat offset by the loss of time on the ground which must result in fewer hours being flown in the year.

Influence of Structure Weight

The structure weight is meant to include that part of the aircraft which consists of wings, body, tail units, landing gear and controls. The term is rather vague as there has to be an arbitrary distinction between passenger equipment and aircraft structure. I have included an allowance of 25 per cent. of the gross pay load under the heading of passenger equipment, which is meant to cover chairs, windows, luggage compartment, lavatory, etc. The structure weight percentage of the gross weight assumed hitherto has been 42 per cent. During the war we used to base our estimates on a structure weight of



33 to 36 per cent.; but it must be remembered that this referred only to an aircraft stripped to its essentials. Load factors were low throughout, compared with modern practice, while a failure of a landing gear was considered as an every-day incident. Nowadays such a happening is so rare as to call for a special enquiry. I consider that 42 per cent. is a little higher than it need be. For the sake of interest I have prepared Fig. 4, which gives the Factors of Usefulness for lower structure weights. The present tendency is rather towards increasing structure weight still further for the sake of increased reliability. Surely it is better to replace such things as hinge pins, brake drums, etc., when they are worn out than to carry the extra weight necessary to make them everlasting.

Influence of Parasite Drag

The reduction of parasite drag is all-important at speeds of 130 m.p.h. and more. The figure of 25 lb. drag per 1,000 lb. weight at 100 m.p.h. that we have assumed so far, corresponds to a cabin monoplane with the landing gear retracted. The only portion of the drag that is likely to be reduced is that which arises from cooling the engines, which are assumed to be radial air-cooled engines with the best type of ring cowling available at the moment. I do not think that we shall improve much on this drag unless we use liquid- or steam-cooled engines with wing radiators. This will almost certainly mean heavier power units and increased cost of upkeep. Fig. 5 shows the increase of cruising speed possible if the parasite drag is reduced, and also the loss of speed when it is increased. It will be seen that with no parasite drag at all, the economic speed rises from 130 to 168 m.p.h., while, if the drag is increased from 25 lb. per 1,000 lb. at 100 m.p.h. to 60 lb., the speed is reduced to 107 m.p.h. As a matter of interest, I might mention that the H.P.42 has a drag in the neighbourhood of the latter figure, and that the "Argosy" is somewhat worse. The "Atalanta" is not quite as good as 25 lb., chiefly because the landing gear is not retractable. The Boeing 247 is about 25 lb., calculated from the published performance. I do not suggest that high drag is necessary in biplane design. The de H.86, which is at present undergoing trials, is enormously improved in the matter of drag. Performance figures are not yet available, but it may well prove that what has been lost by the comparatively small number of struts and wires is made up by the lower profile drag of the thin biplane wings. (See FLIGHT, February 22, 1934.—ED.)

Influence of Wing Loading

It is a constant temptation to all aircraft designers to reduce the size of the main planes—that is, to increase the landing and take-off speed. Our original assumption was that 15 lb. per sq. ft. was as high as it was reasonable to go, for monoplanes, and consequently it ought to be a little lower for biplanes—whose maximum lift coefficient is lower. I have estimated the influence on speed due to alteration of wing loading. Curiously enough, it is almost exactly one mile an hour for a change of 1 lb. a sq. ft. between 12 and 20 lb. per sq. ft. This assumes that the size of the body is not altered for the smaller wings. Increasing the loading from 15 to 20 lb. per sq. ft. results

in a gain of 5 m.p.h., which is an increase of not quite 4 per cent. in speed, and slightly more in the Factor of Usefulness. There will be small further gain as the structure percentage will be slightly reduced.

Influence of Fuel Consumption

The combined fuel and oil consumption at cruising speed was 0.54 lb. per b.h.p. hour in our original design assumptions. This is about as good as we can hope to get with modern petrol engines using fuel with an octane rating of 73. Using higher compression ratios, which is possible with better petrol, a small decrease of consumption can be expected. When it is possible to use compression ignition engines we can expect a combined fuel and oil consumption at cruising speed of at least 0.4 lb. per b.h.p. hour. Assuming that such engines weigh no more than those which work on petrol, we should get an increase of the Factor of Usefulness due to the increase of pay load on our original aeroplane at 130 m.p.h. from 28.9 to 30. The economic speed will still remain unaltered, but the penalty of flying beyond this speed will be slightly less than before.

Conclusions

From the discussion of the effect of changes in the original design characteristics, it appears that the most economic speed is altered chiefly by change in the parasite drag. It can be altered to a considerable extent by flying at various heights and to a lesser extent by changing the wing loading. On the other hand, the Factor of Usefulness can be altered independently by changing the range, the percentage of structure weight and by variation of the specific engine consumption as well as by the alteration of speed caused by varying the three former characteristics. The aircraft designer has two main things to attack, parasite drag and structure weight. Although there has been a tendency for structure weight to increase, due partly to more severe stressing conditions, I think that once it is realised that a comparatively small change may make the difference between commercial success and failure, designers will find ways of reducing it somewhat. I hesitate to make any prophecy; but I believe it will be possible to reduce the percentage from 42 to 38 without increasing the cost of the aircraft to any extent. The reduction of parasite drag below 25 lb. per 1,000 lb. weight at 100 m.p.h. is likely to be very difficult. I think that it would be a great achievement to reduce it to 20 lb. Unless something entirely new is devised in aeronautics, I am afraid that it will be very costly to fly at speeds much above those which I have indicated as economic. At the same time, it is quite likely that there will be a certain amount of freight, such as very urgent mails, for which the public will be willing to pay a rate many times greater than the normal. As air traffic increases the chances of this happening will become greater; some day or other there is sure to be a limited number of these ultra-fast craft, but I do not think they will often be used to carry passengers.

(The discussion, interesting because most speakers seemed somewhat to misinterpret Major Green's conclusions, will be dealt with next week.—ED.)

AIR TRANSPORT SECTION, S.B.A.C.

THE Air Transport Section of the Society of British Aircraft Constructors, which was closed down when the number of British air transport companies was reduced to one with the formation in 1924 of Imperial Airways, was re-formed on Thursday, March 1, at a meeting of air transport operators and owners of airports and aerodromes at the Society's offices, 1, Albemarle Street, London, W.1. Mr. H. J. Thomas, Chairman of the Society, presided. In an introductory speech he stated that the Council of the Society decided some time ago to revive the Section in the light of recent developments in air transport and because opinions had been expressed that the Section could again play a useful part by giving aircraft operators protection and furthering their interests. Resolutions reconstituted the Section in two divisions, one to represent air transport operating concerns and the other the owners, including municipalities, of airports and aerodromes.

AIR LINE TO SOUTH AMERICA

It is reported that an agreement has been signed between French and German companies for the joint exploitation of a South American air line. The agreement

is subject to the approval of both governments, and, it is also reported, General Denain, the French Minister for Air, is examining the agreement.

FARTHEST NORTH SOVIET AIR LINE

EXPERIMENTAL flights between Krasnoyarsk and Igarka, the most northerly air route in the world, have been made since the middle of January and have proved the possibility of establishing regular air communications on this line in the winter. The length of the route is 1,125 miles (1,800 km.). The aeroplanes call at Yeniseisk, Podkamenka-Tunguz, Upper Imbatsk and Turkhansk. Six flights on this route have already been made, the machines carrying passengers, mail and other freight.

HIGH SPEED AEROPLANE FOR THE "ASAHI"

THE aeroplane works of the Kawasaki Dockyard Co., of Kobe, Japan, have under construction a high-speed transport machine of special design for the *Asahi Shimbun*. The new machine is expected to have a maximum speed of 217.5 m.p.h. (350 km/hr) and a range of 1,305 miles (2,100 km) at the cruising speed of 186.4 m.p.h. (300 km). The engine to be fitted is a Kawasaki B.M.W. IX 800 h.p.

ATTITUDE OF THE RAILWAYS

DURING the past two weeks the main railway companies have held their annual general meetings. Last week we quoted the terms in which Sir Josiah Stamp, of the London Midland & Scottish Company referred to the recently formed air-rail combine, with Imperial Airways. We expressed our views on this matter very fully in a leader on the subject. This week we quote from the speeches made at the meetings of the Southern Railway and the Great Western Railway. Nothing concerning the air was said at the meeting of the London & North Eastern Railway, at which Mr. William Whitelaw presided.

Mr. Gerald E. Loder, Chairman of the Southern Railway Company made the following references which emphasised the protectionist nature of the combine:—

" . . . Notwithstanding more intensive competition by air, we carried 174,000 more passengers by our own cross-Channel and Channel Islands services. . . . We have been carefully watching the development of transport by air, particularly its present and potential effect upon our traffic. We are already suffering from a diversion of our cross-Channel traffic, particularly between London and Paris, and to a small extent in our Channel Islands traffic, and the time has arrived when some definite action should be taken to protect our interests. In co-operation with the other main line railway companies and Imperial Airways we have decided to make the necessary arrangements for providing, if need be, such air transport services as we and the other railway companies may think fit to establish, and I wish to assure you that everything possible will be done in this direction to safeguard your interests. . . . "

Mr. Leslie Boyce (discussing the Chairman's report) said that the railways had often been criticised for their depression in consequence of their not having anticipated some eight or ten years ago the development of road transport. It could not be said that the railways had not got in early in respect of air transport. . . . "

Sir Robert Horne, Chairman of the Great Western Railway Company, dealt with the matter in a more constructive spirit, constructive, that is, from the development of air services point of view:—

" . . . A new item appears in this account—namely, air transport. This experimental service caused a loss for the year of £6,526, but it gave us cheaply-purchased experience which will be of benefit to us in the future. . . . A more recent and more dramatic development of this spirit of combined operation is in connection with a projected air service. In this sphere of activity the Great Western has done some experimental work, as you learned from an earlier paragraph of my speech. Since we obtained Parliamentary Powers in 1929 to operate air-transport services, we have been carefully watching the development of the aeroplane as a means of transport and the steps taken by municipal and other authorities to provide terminal facil-

ties which form such an essential part of this mode of transport. Considerable progress has been made, but much remains to be done before the aeroplane becomes a travel unit in this country capable of being operated on an economic basis. We recognise that some time may still have to elapse before this latter state of affairs is achieved, but the steady augmentation in the number of passengers travelling by air, the great development in speed of aircraft, and the growth in the number of companies associating themselves with this movement are definite signs of progress and 'air-mindedness,' which we would not ignore if we could. We felt, therefore, that the time had arrived for us to test the public demand for air-travel facilities, and we accordingly inaugurated the route between Birmingham, Cardiff, Torquay and Plymouth in conjunction with Imperial Airways, Limited. It was in the nature of an experiment, but it has afforded us very useful data for determining future policy. One of the principal factors which influenced us in selecting the route was that it enabled travellers between Birmingham, South Wales and Devonshire to effect a considerable saving of time. But the high cost of providing adequate terminal facilities entailed a heavy loss on the company, and unless a greater measure of co-operation in this respect is accorded by local interests those who assume the responsibility and bear the expense of running the machines may be discouraged from extending the service. There is no doubt in our minds that the solution of the problem of the proper sphere of the aeroplane in relation to the other transport systems of this country lies in taking into view the British Isles as a whole and not considering merely the comparatively narrow area of each individual railway company's territory. As you will have seen from the recent announcement in the Press, the four main-line railway companies have entered into an agreement with Imperial Airways, Ltd., for the formation of an independent company, with a nominal capital of £50,000, for the purpose of developing services in the British Isles and linking up with the existing services operated by Imperial Airways, Ltd. Its functions will be to provide and operate such machines as the companies may require for any service which they desire to provide either individually or jointly. Under the proposed arrangements I anticipate that you will find individual railway companies operating services on particular routes peculiar to their own spheres of activity, and in other instances one or more companies combining to develop a route in which they are jointly interested. It is a feature of these agreements that the railway companies will have the advantage of all the experience accumulated by Imperial Airways, Ltd., and the benefit of their advice and skill in acquiring the necessary machines. Although a narrow island such as ours does not afford great scope for extended air services we shall hope in the course of time to provide the public with the greatest facilities for transport by air that the conditions permit."

AIRPORT NEWS

CROYDON

ONCE upon a time spring did not start at the Airport of London until long after the first cuckoo had been heard on the aerodrome, but that was in the times when nightingales sang every night from copses which have now been replaced by boundary fences of chequerboard black and white. To-day spring starts on March 1, with the inauguration of spring time-tables for some companies. This year K.L.M. started March with a 7.0 a.m. departure from Croydon to link Berlin with London and to allow passengers, if need be, to return to London the same evening after having spent some 3½ hours in Herr Hitler's capital. This means a service leaving Berlin at 4.0 p.m. and flying via Amsterdam to arrive at Croydon after dark, at 8.30 p.m. This, with the D.L.H. 9.45 a.m. departure from Croydon for Berlin and the arrival from that city at 1.45 p.m., gives Berlin and London quite convenient connections.

Imperial Airways, Ltd., also inaugurated a late departure for Paris about the same date and an after-dark arrival at 6.45 p.m., which, by a curious coincidence is overhead to the minute, as I write these lines.

There are people, I am told, who fly by these night services for choice because of the attraction of flying over rapidly darkening country and of seeing towns and railway lines lit up. There are even passengers, I am informed by those who attend to passengers passing through the airport, who find a thrill in night landings with the searchlights on, and the floodlights illuminating the tarmac as they disembark. This latter word, by the way, with due respect to our touchy aeronautical purists, is a better word than "disemplane." On these night services loads are astonishingly good, considering that it usually takes people a week or more to realise they are in existence. The truth is we do not sufficiently advertise their commencement, and some communal advertising amongst air traffic companies on the "Eat more fish" idea would usher spring and summer services in with maximum effect and minimum expense for all concerned.

On Saturday, March 3, we had a visitation by air of directors and supporters of Aston Villa, 38 of them in all. They were accommodated in one Avro 10, two Air-speed "Ferries" and two "Fox Moths" from the fleet of Midland & Scottish Air Ferries, and very spick and span the silver and red machines looked. The visiting pilots were Sqd. Ldr. Malet and Messrs. Mavrogordato, Parkes,

Pelly and Hattersley, who returned to Hooton Aerodrome later in the afternoon. Capt. F. W. Haig, late of the Australian Air Force, and now aviation manager of the Vacuum Oil Co., Ltd., in Australia, arrived at Croydon last week. He had come from Darwin by air as much as possible, with numerous business halts by the wayside. He had used the following air services on his way to England: K.L.M., Imperial, K.L.M. again, Imperial once more, an Italian air line, Air-France, and finally, like a good Briton, Imperial Airways to end up at Croydon.

One of the younger generation at the Airport of London has just queried my nightingale story, because one has not been heard at Croydon within the memory of living child. When I mentioned that they used to sing nightly in Plough Lane I found myself committed to ancient history. The old airport, almost as big as a village, has so completely disappeared that it is hard to convince people that it was situated somewhere in the middle of the present vast expanse of green grass landing area. It is as lost to sight and to mind as the cities of the Plains, and yet it throbbed with sunny life in its time. To the old hands in civil aviation it brings back vivid memories of Gen. Brancker, George Powell, Larry Carter, Hinchliffe, Minchin and other gallant pioneers.

To return to the present. It is pleasant to relate that since March 1 weather conditions have been consistently better. The first 8.30 p.m. landing was made by bright moonlight on March 1, somewhat assisted, of course, by the landing light on the K.L.M. machine and the aerodrome searchlight. Good weather is all important at the commencement of the spring late services. This particular arrival may have on board passengers from Halle, Leipzig, Essen, Mullheim, Prague, Copenhagen and Malmö and other places.

I am informed that when the new newspaper kiosk in the middle of the Main Hall here is ready for occupation

the present shop is to become the office of Surrey Flying Services, Ltd. It is admirably placed for a booking office—first on the right as you enter the main doors.

Mayor Jimmy Walker was at the aerodrome on Monday last. He was collecting some special freight from Paris. He was shown round the airport which, though a frequent passenger mostly by Imperial Airways, he had never seen in detail before.

A. VIATOR.

HESTON

THE new Heston terminal building is to be opened to the public on March 12. By focusing the offices of operating companies, Customs services, weighing machines, cloakrooms and waiting rooms into a compact group, transit from omnibus to air liner, and from ground taxi to air taxi, will be entirely under cover.

February, with only 13 fine days, was the worst weather month since records of the Airwork School of Flying were instituted at the end of 1932. Nevertheless a 54 per cent. increase in school flying over February, 1933, when flying days were as many as 18, was recorded.

Visitors to Heston this week included M. Roger Gerard in his Caudron "Phalene" ("Gipsy III"), who returned to France on the 25th after a visit to the British Industries Fair; M. Hansez, in his "Fox Moth" ("Gipsy Major"), on a visit from Antwerp; and M. Laurencin, who flew his new "Leopard Moth" ("Gipsy Major") home to Belgium.

On Tuesday the Restaurant proper was opened again for meals, and the lounge resumed its normal functions. Parquet flooring, soft buff-coloured wallpaper and two new radiators now exclude the chills of early spring.

THE AERODROMES

AN Aerodromes Advisory Board, representing all the major professional, technical, and official interests which are, or may be, concerned in the development of the groundwork of civil aviation, was recently formed under the chairmanship of Capt. F. E. Guest, M.P.

The Board has been formed to continue and expand on a wider basis preliminary investigations carried out during the last few years by the Aerodromes Committee of the Royal Institute of British Architects. The membership of the Board for 1934 has now been completed, and consists, in addition to Capt. Guest, of the following representatives appointed by the various constituent institutions:—

INSTITUTION OF CIVIL ENGINEERS.—Sir Leopold Savile and Sir John Thornycroft.

INSTITUTION OF MECHANICAL ENGINEERS.—Mr. Alan Charlton, M.P. (president), and Maj. J. Kidston Allsop.

INSTITUTION OF ELECTRICAL ENGINEERS.—Mr. P. V. Hunter (president) and Mr. C. C. Paterson (past-president).

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—Sir Giles Scott (president) and Mr. Maurice E. Webb (vice-president).

CHARTERED SURVEYORS' INSTITUTION.—Sir John Oakley and Mr. Dendy Watney (past-presidents).

ADVISORY BOARD

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.—Maj. L. Roseveare (president) and Mr. A. T. Gooseman.

TOWN PLANNING INSTITUTE.—Mr. W. R. Davidge and Mr. F. Longstreth Thompson (past-presidents).

ASSOCIATION OF CONSULTING ENGINEERS.—Mr. A. M. Sillar (chairman) and Col. J. D. K. Restler.

ROYAL AERONAUTICAL SOCIETY.—Mr. C. R. Fairey (president), Lord Sempill (past-president), Mr. Nigel Norman, and Mr. Ivor McClure.

AIR MINISTRY.—Lt.-Col. F. C. Shelmerdine, Director of Civil Aviation, and Col. J. F. Turner, Director of Works and Buildings.

ELECTRICITY COMMISSION.—Mr. T. P. Wilmshurst.

MINISTRY OF HEALTH.—Mr. G. L. Pepler, Chief Town Planning Inspector, who is vice-chairman of the Board.

The general object which the Board has been formed to promote is to explore and develop every available means for securing the reservation of sufficient numbers of suitable sites for aerodromes, the rapid and properly planned development of aerodromes and airways, and the sound design of aerodrome buildings and their layout and equipment. The Board is now starting on a wide programme of survey and research work. The secretary to the Board is Mr. John Dower, to whom all communications should be addressed at 5, Verulam Buildings, Gray's Inn, W.C.1.

Aerodrome for Northampton

THE Development Committee of the Northampton Corporation is considering the possibilities of acquiring the aerodrome at the Obelisk Farm at Boughton, two miles from the town. This aerodrome is at present being used by the Northamptonshire Aero Club, the members of which have, for some time, been trying to persuade the Corporation to take over the aerodrome. Sir Josiah Stamp is to be approached with a view to securing the co-operation of the L.M.S. Railway.

Aerodrome for Rajpipla

PLANS are already being made to lay out a well-equipped aerodrome close to the palace of the Maharaja of Rajpipla in Rajpipla City. Flt. Lt. Benley and Mr. C. M.

Eastley, the chairman of the Bombay Flying Club, are advising the Maharaja.

A new aerodrome for Calcutta

It is reported that a proposal is on foot to make a new aerodrome in the neighbourhood of Calcutta. Much money has been spent on Dum Dum, and it is not supposed that it will be closed down. The new site is at Alipore, within a short distance of the centre of the city. It is stated that Indian National Airways will manage the new aerodrome.

Aerodromes for Malaya

It is reported that about 20 aerodromes are to be laid out in Malaya during the next two years, to form a link between Singapore, Alor Star and the Siamese border. All the sites have been surveyed by the Royal Air Force.

AIRISMS FROM THE FOUR WINDS

Arctic castaways rescued by air

TEN women and two children belonging to the Soviet scientific party, which, owing to the sinking of its ship, the *Chelyuskin*, near Wrangel Island on February 14, had been adrift on an ice floe for nearly three weeks, were rescued by two Soviet airmen on Monday, March 5. After their ship had been crushed by ice floes, the ninety members of the party took to the ice, and for days their rescue by dog team or aeroplane was made impossible owing to terrific blizzards and drifting ice. Flying from Cape Wellen, M. Lapidevsky and a companion managed to land on an improvised aerodrome three miles from the camp on the ice. The women and children were taken in a boat saved from the *Chelyuskin* across an unfrozen fissure to the aeroplane while the temperature was 40 degrees below zero, and were flown back to Wellen Camp. Both landing and take-off required only about a 200-yard run. The ice is breaking up, but the spirits of the 78 men who remain have been raised by the rescue of the women and children. There is, however, little hope of immediate rescue, owing to the extreme difficulty of landing on the icefield.

Capt. Costes' adventure

CAPT. COSTES, the well-known French airman, left Le Bourget at 12.15 p.m. on Saturday, March 3, to fly to Copenhagen in his Caudron-Phalene monoplane, which is fitted with a 150-h.p. Hispano-Suiza engine. It was his intention to fly to Copenhagen non-stop. He did not arrive at the scheduled time and after a bit considerable anxiety was felt for his safety, so much so that two Danish Naval machines were sent out from Esbjerg to search the sea in the vicinity of the route over which Capt. Costes might have flown if he had navigated on a straight line or if he had deviated from such a course to the north. After he had been missing for about 48 hours, the airman was located, quite happy and comfortable, in a hotel at Munster, Westphalia. It transpired later that he had landed at about 5 p.m. on Saturday evening. There appears to be something wrong somewhere. Either Capt.

Costes did not take the trouble to wire off the news of his landing, which was due to fog, or else the aerodrome authorities were at fault in not sending out news of his arrival. The result was that a vast amount of unnecessary trouble and worry was caused, and the airman himself was given quite a little publicity in various newspapers, which was uncalled for and, we hope, unwanted. As the authorities at Croydon and other large air stations will agree, the vital necessity of reporting landings as quickly as possible cannot be too strongly impressed on the minds of cross-country aviators.

Award to Mr. Mollison

It has been announced by the Royal Aero Club that the Committee has decided to award the Britannia Trophy for the year 1933 to Mr. J. Mollison in recognition of his flight from England-Brazil in February, 1933. The Britannia Trophy is awarded annually to the aviator who, in the opinion of the Club, has accomplished the most meritorious flight during the year. Mr. Mollison flew from England to Brazil in 82 hr. 8 min.

Mlle. Maryse Hilz

MARYSE HILZ, the French airwoman, who is flying from Paris to Tokyo, was held up by bad weather on the Hongkong-Shanghai stage of the flight. Later she arrived at Shanghai.

England-Australia air race

MESSRS. KAY AND PIPER, who made an England-Australia flight in 1930, have announced their intention of entering for the MacRobertson race.

Koolhovens for Dutch aviation reserve

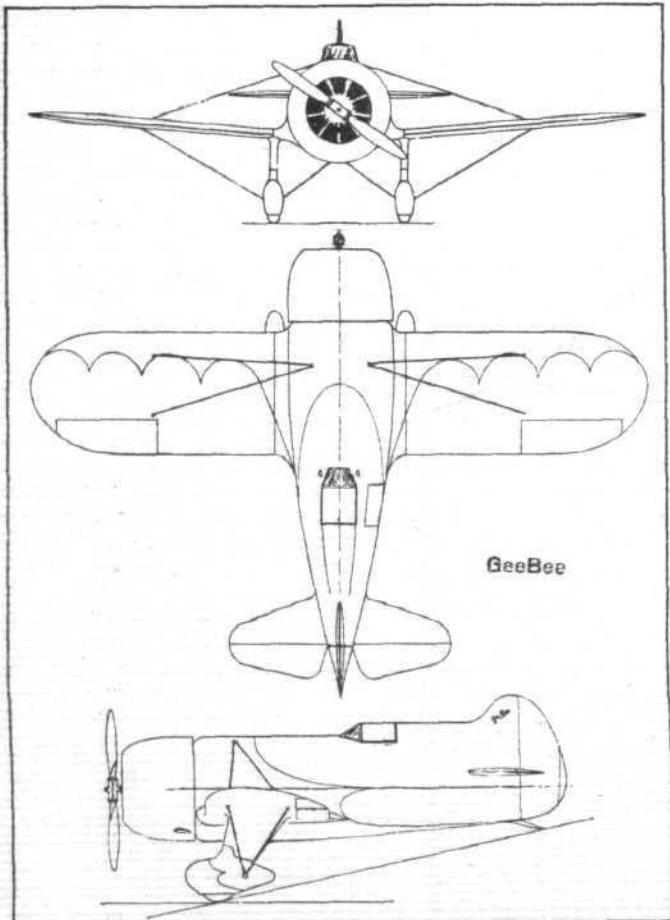
THE Dutch National Aviation School, at Waalhaven, Rotterdam, which trains officers of the Dutch Aviation Reserve, is to be equipped with Koolhoven F.K.46 training aircraft. It was intended some while ago that a D.H. "Tiger Moth" should be bought for the school, but Dutch aircraft constructors protested at this acquisition of foreign material and, apparently, their opposition has met with success. The Koolhovens, however, will be fitted with D.H. "Gipsy Major" engines.

Landplane speed record beaten

"JIMMY" WEDELL, while demonstrating the latest version of the Wedell-Williams racing monoplane, which was shown for the first time at the New Orleans Meeting held recently, attained a speed of 264.703 m.p.h., which is about 15 m.p.h. faster than the present international record for landplanes over a 100-km. closed circuit. Wedell's machine is fitted with a "Twin Wasp" engine of about 700 h.p., driving a variable-pitch airscrew. Landing wheels and tail skid are retractable. It is possible that the aircraft may be entered for the forthcoming England-Australia Race.

The Vickers "Vincent"

THIS machine has been adopted for the British Royal Air Force as a "General Purpose Aircraft." It is fitted with a Bristol "Pegasus" engine and has been specially designed for operation overseas, and will be used mainly by units of the Middle East Command, who were responsible for the extended Service trials which were successfully carried out with the prototype. The machines which are to be supplied to the Royal Air Force will be fitted with Handley Page wing-tip slots, and the following aircraft accessories of Vickers design and manufacture will be incorporated: Vickers wheel brakes, oleo pneumatic shock absorbers, Potts oil coolers. The many and varied duties which the "Vincent" may be called upon to perform require a very complete and comprehensive equipment and, to comply with the conditions which prevail in Iraq and similar countries, each aircraft will be completely fitted out as follows: provision for crew of three, navigational instruments, hand operated inertia engine starter, sleeping bags for crew, drinking water tank and emergency rations, intercommunication speaking tubes, oxygen breathing apparatus, first-aid outfit, wireless telegraphy and telephone (transmitting and receiving) with masts for emergency use from the ground, electrical gear for lighting, etc., automatic air cameras, Very pistol and complete set of pyrotechnic signals, fire extinguisher, safety belts, parachutes, maintenance ladder and tool kits, message picking-up gear, full complement of guns and bombs, underslung auxiliary fuel tank allowing of a range of 1,250 miles in ten hours. Approximately 4,250 lb. of fuel, and a crew and military load can be carried.



THE GEEBEE "INTERNATIONAL SUPER-SPORTSTER": An American design for the England-Australia race. A short description of this aircraft appeared in "Flight" for February 22.

An American long distance flight planned

MR. CLYDE PANGBOURN and a friend are planning a non-stop flight in the spring from New York to Buenos Aires or Rio de Janeiro. The machine to be used will have a top speed of 160 m.p.h. and a range of 7,000 miles.

Fast Japanese fighters

On January 24 a flight of Nakajima "91" monoplane fighters ("Jupiters") of the 5th Air Regiment, Tachikawa, covered the distance of 261 miles (420 km) (Osaka-Tokyo) in 1 hr. 9 min., thus developing 376 km/hr—or at an average speed of 233.6 m.p.h. Furthermore, a squadron of Kawasaki "92" biplane fighters of the 4th Air Regiment, Tachiarai, flew in just 2 hours between Keijo, Korea, and Tachiarai, Fukuoka, on their way home from Manchoukuo, at the cruising speed of 186.4 m.p.h. (300 km/hr) on January 26.

Z. D. Granville killed

WHILE flying a Gee Bee "Sportster" racing monoplane recently, Mr. Z. D. Granville, of the Granville, Miller & De Lackner Co., spun into the ground from 70 ft. and was killed. Mr. Granville recently designed two machines for the MacRobertson race.

"Flying on a Rainbow"

No colour-blind workman can be employed at the plant of the Boeing Airplane Company, of Seattle, Washington, one of the world's leading producers of commercial and military aircraft. To guarantee that proper material will be used for the proper part, the company has a system of colour identification code for all standard materials. As an example, there are five main grades of steel sheet, two main grades of steel tubing, and five main grades of aluminium and aluminium alloy tubing. Each grade is given a different colour identification by which shop workers are guided.

A LeO strike

As the result of a dispute between the Lioré et Olivier Company, of Argenteuil, Paris, and its employees, who stopped work for a day, the works have been temporarily closed. The company has received an order for about 45 Dewoitine D.500 type single-seater fighter monoplanes from the French Air Ministry.

What wakes up Gwadar

THE inhabitants of Gwadar, on the Persian Gulf, are now quite accustomed to the sight of Imperial Airways' aeroplanes arriving and departing, but when a motor van was recently landed at this remote spot the people were so excited that for a moment some anxiety was felt that a fanatical movement had arisen.

The pearls of Bahrein

THE island of Bahrein, in the Persian Gulf, which is one of the halting places of Imperial Airways, has long been famous as a pearl centre. The number of pearls carried from the island to India by aeroplane is increasing every week. To carry pearls from Araby to the Indies is romantic enough for Lalla Rookh. The return trade is more prosaic, as it consists largely of betel nut, which is used as the chewing gum of the East, and accounts for the patches of apparent blood which defile the footpaths of most Asiatic towns.

Airscrew noise

SPECIAL equipment has been installed at Langley Field, Virginia, for the study of airscrew noises. The apparatus consists of a hollow steel body, 30 in. in diameter, thoroughly streamlined, in which an electric motor is built, with a shaft extension for the direct mounting of an airscrew. The engine develops 200 h.p. at 3,600 r.p.m., and the engine speed may be precisely regulated between 1,000 and 3,600 r.p.m. Sound waves from the airscrew are received by a microphone and analysing apparatus which permit the location of their origin.

Aerial Red Cross in Holland

LAST December the new arrangement whereby the Dutch Red Cross Association has the disposition of an aeroplane from the Department of Aviation was put into practice for the first time. At about ten o'clock on December 9 a telephone call was received at Utrecht asking for the machine to be sent to the island of Schiermonnikoog, off the north coast, to take two girls to hospital at Grönigen for immediate operations. The aeroplane left Utrecht at about half-past ten and landed on the island, more than 100 miles away, at a quarter to one. The patients and a doctor were waiting, and within a few minutes they were on their way to the mainland. They arrived at Eelde aerodrome at half-past one, and a waiting ambulance carried them to the hospital at Grönigen. The aeroplane



THE SAME THING, ONLY DIFFERENT : On the top is a Fokker F.VIII (2 Bristol "Jupiters") in its original form. Below it is seen equipped with two Wright "Cyclone" F/R1826 engines, mounted in the leading edge of the wings. (Photo. Ellemeet.)

was back at Soesterberg aerodrome at half-past three, the whole journey of about 350 miles having occupied just five hours.

College of aeronautical engineering

MR. J. G. BROWN, on completion of his course of training at the College, has been appointed Assistant Manager of the Cinque Ports Flying Club, Lympne. The following students are now completing the final period of their training under commercial conditions with firms co-operating with the College:—de Havilland Aircraft Co., R. M. Mirza ; Bristol Aeroplane Co., W. P. Lewis ; Air-work, C. H. Hunter, F. E. Baxter, K. S. Robinson ; Comper Aircraft Co., G. A. Mann, J. F. Elston ; Air Service Training, D. Stewart, R. N. Needham, J. C. Hornby, E. J. Riddle, J. W. Truran ; A. V. Roe & Co., F. L. Farquharson, A. H. Martin ; General Aircraft, F. S. Dorabjee, D. K. Horsfield, H. B. D. Box ; Pobjoy Air-motors, A. T. Carey, K. C. Griggs ; Brooklands Aviation, R. E. Leete, M. N. Crossley, R. N. Wimshurst, F. D. Sawyer.

Fountain Hotel aerodrome

THE Whaddon Chase Point to Point, which takes place on Saturday, March 10, will use Fountain Hotel Aerodrome as a starting place for races. This provides any pilots who are keen horsemen, or horsewomen, with the chance of being able to visit a Point to Point by air. The first race starts at 1.15 p.m. and the aerodrome will be closed between the hours of 12 and 5 p.m. Fountain Hotel Aerodrome is at Loughton, Bletchley, Bucks.

Detonation

"The Causes of Detonation in Petrol and Diesel Engines" was the title of a paper presented on March 6 to a joint meeting of the Institution of Automobile Engineers and ten other institutions by G. D. Boerlage and Dr. W. J. D. van Dyck, of Bataafsche Petroleum Maatschappij, Delft, Holland. The authors put forward the view that it is correct to look on the phenomena of combustion in Diesel and petrol engines from the same aspect. Detonation may occur in any class of engine, and is actually a vibration in the air charge, due to a local rapid pressure rise. It is met most commonly in "pinking" petrol engines, but occurs also in Diesel engines. Knock, on the other hand, indicates mechanical vibration, mainly of walls, due to a rapid pressure rise. It is inherent in the petrol pink as well as, in many cases, to the Diesel process. Roughness or "bumpy" running is reserved for those cases where heavy engine parts are set in vibration.

Dowty's undercarriage on British Klemm

IN the course of our remarks about the British Klemm "Swallow" last week we mentioned the fact that the undercarriage had been redesigned, and that it was now strong enough to cope with almost stalled landings. We should have pointed out, as well, that this undercarriage, like those on so many other of our best aeroplanes, is designed and built by Mr. G. H. Dowty, of Aircraft Components Co., Grosvenor Place South, Cheltenham, Gloucester.

THE AIR ESTIMATES

THE Air Estimates for the year 1934† were issued on March 2 and show a net increase of £135,000 as compared with last year's estimates. The gross estimate is £20,165,000, but appropriations-in-aid are expected to amount to £2,604,600, thus reducing the total for effective and non-effective services to £17,561,000.

STATEMENT OF AIR EXPENDITURE, 1928 TO 1932, AND OF AIR ESTIMATES, 1933 AND 1934.

Vote A Numbers.	Financial Year:	1928	1929	1930	1931	1932	1933 (Estimate)	1934 (Estimate)
		£	£	£	£	£	£	£
1 Pay, etc., of the Royal Air Force		3,530,219	3,550,413	3,710,848	3,836,741	3,866,857	4,110,000	4,210,000
2 Quartering, stores (except technical), supplies and transportation		1,651,116	1,670,589	1,697,433	1,525,545	1,470,787	1,487,000	1,490,000
3 Technical and warlike stores (including experimental and research services)		6,402,616	6,968,333	7,681,057	7,846,336	7,352,003	7,203,000	7,220,000
4 Works, buildings and lands		1,756,005	1,852,543	1,606,732	1,724,928	1,523,535	1,610,000	1,675,000
5 Medical services		292,060	279,921	290,715	294,153	286,198	285,000	295,000
6 Technical training and educational services		505,789	475,251	486,069	474,596	418,521	384,000	373,000
7 Auxiliary and Reserve Forces		533,863	578,842	587,751	591,011	521,982	464,000	394,000
8 Civil aviation		353,764	408,984	439,985	465,767	462,305	490,000	513,000
9 Meteorological and miscellaneous effective services		219,494	221,466	227,519	229,909	223,122	358,000	341,000
10 Air Ministry		650,738	657,938	664,799	638,321	637,556	645,000	657,000
11 Half-pay, pensions and other non-effective services		194,506	213,900	235,046	240,492	294,255	390,000	383,000
Balances irrecoverable and claims abandoned		1,765	2,384	3,719	1,149	250	—	—
Net Cash Expenditure		16,091,935	16,880,564	17,631,673	17,868,948	17,057,371	17,426,000	17,561,000

Note.—The figures for expenditure represent the net expenditure after taking into account receipts noted in the Appropriation Account as receipts in excess of estimated appropriations-in-aid.

* Includes Army personnel attached to the Royal Air Force, but excludes Royal Air Force personnel serving in India, or in receipt of pay from non-effective Votes only, or lent to Dominion, Colonial or foreign Governments.

Personnel

The numbers of personnel to be borne on the establishment of the R.A.F., or attached thereto, exclusive of India, but including Aden:—*Air Officers*: Total, 41 (an increase of 3). *Other Commissioned Officers*: 3,150 (same as last year). *Cadets*: 110 (a decrease of 20). *Warrant Officers*: 450 (a decrease of 70). *Non-Commissioned Officers*: 6,450 (an increase of 450). *Aircraftmen*: 19,049 (an increase of 7). *Apprentices*: 1,750 (a decrease of 370). Number to be voted: 31,000 (including Army personnel attached to the R.A.F.) (same total as last year).

Financial Expenditure

Vote 1.—Estimate of the sum required for pay, etc., of the R.A.F.:—Pay and personal allowances of officers, £1,239,000; Pay and personal allowances of airmen, £2,345,000; Marriage allowance, £136,000; National Insurance schemes—employer's contributions in respect of airmen, £77,000; Miscellaneous allowances and payments, £27,000; Civilians, £955,000; Service gratuities to airmen on discharge, etc., £12,500; Recruiting staff and expenses,

EXPLANATORY STATEMENT SHOWING THE PROVISION IN ESTIMATES, 1934, FOR SCIENTIFIC RESEARCH AND TECHNICAL DEVELOPMENT, CORRESPONDING TO THE PROVISION MADE FOR THESE SERVICES IN 1933.

Subhead of Vote 3	Service	1934	1933
A.	Aeroplanes, seaplanes, engines and spares	806,000*	760,000
B.1	Royal Aircraft Establishment, Farnborough	64,500	64,500
B.2	Salaries, etc., of personnel at other Experimental and research establishments	70,500	70,500
D.	Instruments and photographic equipment	58,000	54,000
E.	Armament and ammunition	66,500	70,000
F.	Wireless and electrical equipment	102,500	97,000
G.1	General (components and accessories)	123,000	130,000
G.2	Contributions and grants	85,000	80,000
J.	Balloons and hangars	4,000	4,000
	Gross Total	1,380,000	1,330,000
	Deduct—Appropriations-in-aid	41,000	41,000
	Net Total	1,339,000	1,289,000
Add—	Provision in other Air Votes—		
	Vote 2. Quartering, stores (except technical), supplies and transportation	10,000	9,500
	Vote 4. Works, buildings and lands	2,500	10,000
	Vote 9. Miscellaneous effective services	1,000	1,000
	Vote 10. Air Ministry (Joint Directorate of Scientific Research and Technical Development)	75,000	75,000
	Vote 11. Non-effective services	500	500
		1,428,000	1,385,000

* Includes £30,000 for experimental machines of civil types.

† Printed and published by H.M. Stationery Office. Price 3s. 6d. net.

£6,500. Gross total, £4,798,000. Appropriations-in-aid, £588,000. Net total, *£4,210,000. Net increase, £100,000.

* Includes approximately £76,000 in respect of personnel hitherto provided for under Vote 7, subhead (g).

Vote 2.—Accommodation allowances, £181,000; Barrack services, £55,000; Fuel and light, £239,000; General stores,

£109,000; Clothing, £193,000; Provisions and animals, £463,000; Transportation, £340,000. Gross total, £1,580,000. Appropriations-in-aid, £90,000. Net total, £1,490,000. Net increase, £3,000.

Vote 3.—*Technical and warlike stores* provide for the following amounts:—Aeroplanes, seaplanes, engines and spares, £5,985,000; Experimental and research establishments, £135,000; Inspection services, £191,000; Instruments, photographic and miscellaneous stores, £188,000; Armament and ammunition, £536,500; Electrical stores, £252,500; Miscellaneous research and development, £229,000; Miscellaneous materials, £127,000; Balloons and hangars, £6,000; Mechanical and other transport, £202,000; Petrol and oil, £877,000; Rewards to inventors and miscellaneous claims, £1,000; Airship development, £19,000. Gross total, £8,749,000. Appropriations-in-aid, £1,529,000. Net total, £7,220,000. Net increase, £17,000.

Vote 4.—*Works, buildings and lands* show the following figures:—Staff for works services, £228,000; New works, additions and alterations, amounting to £2,500 each and upwards, £898,000; New works, additions and alterations under £2,500 each, £105,000; Ordinary repairs, renewals and maintenance, £450,000; Grants towards the cost of works, £1,000; Purchase of lands and buildings, £50,000; Rents, compensations and reinstatements, £30,000; Incidental expenses of Air Ministry estates, £7,000; Miscellaneous works services, £12,000; Stores and plant for works (net), £16,000; Machine tools, £18,000. Gross total, £1,815,000. Appropriations-in-aid, £140,000. Net total, £1,675,000. Net increase, £65,000.

Vote 5.—*Medical Services*.—Pay and personal allowances of officers, £136,000; Pay and personal allowances of airmen, £82,500; Nursing service, £21,000; Fees to civilian medical practitioners, £10,000; Civilians employed in hospitals and sick quarters, £18,500; Medical stores and supplies, £15,000; Payments to hospitals, £27,000; Miscellaneous charges, £2,000. Gross total, £312,000. Appropriations-in-aid, £17,000. Net total, £295,000. Net increase, £10,000.

Vote 6.—*Technical Training and Educational Services*.—Imperial Defence College, pay and allowances and contribution towards general expenditure, £2,800; R.A.F. Staff College, Andover, salaries, wages and contingencies, £11,900; R.A.F. College, Electrical and Wireless School, Cranwell, salaries, wages and contingencies, £124,500; School of Technical Training (Apprentices), Halton, salaries, wages and contingencies, £159,000; School of Technical Training (Men), Manston, salaries, wages and contingencies, £19,200; School of Physical Training, Uxbridge, salaries and wages, £2,900; General educational services, £55,700; Miscellaneous educational charges, £8,000. Gross total, £384,000. Appropriations-in-aid, £11,000. Net total, £373,000. Net decrease, £11,000.

Vote 7.—Auxiliary and Reserve Forces.—(a) Pay and personal allowances of permanent staff, £3,900; (b) Pay and personal allowances during training, £21,500; (c) Retaining fees and reserve pay, £130,000; (d) Payments to civil companies for training courses, £137,000; (e) Miscellaneous expenses, £2,100. Special Reserve: (g) Pay and personal allowances of regular personnel (provision for 1934 included in Votes 1 and 5); (f) Training, £4,600; (g) Miscellaneous expenses, £600. Auxiliary Air Force: (h) Pay and personal allowances of H.Q. staff, £11,000; (j) Pay and personal allowances of regular staff of squadrons, £52,800; (k) Grants to county associations, £13,500; (l) Training, £9,900; (m) Miscellaneous expenses, £2,000. Auxiliary Air Force Reserve: (n) Training, £100. University Air Squadrons: (o) Pay and personal allowances of instructors, etc., £4,000. (p) Miscellaneous expenses, £800. Voluntary Aid Detachments: (q) Miscellaneous expenses, £300. Gross total, £394,100. Appropriations-in-aid, £100. Net total, £394,000. Net decrease, £70,000.

Vote 8.—Civil Aviation.—Salaries and wages, £36,000; Supplies and transportation, £7,000; Technical equipment, stores and experimental services, £11,000; Works, buildings and lands, £37,000; Miscellaneous, £5,000; Subsidies and grants, £577,000. Gross total, £673,000. Appropriations-in-aid, £160,000. Net total, £513,000. Net increase, £23,000.

Vote 9.—Meteorological and Miscellaneous Effective Services.—Salaries and allowances of staff of the Meteorological Office, £50,000; Salaries, wages and allowances of staff at Meteorological stations, £69,500; Fuel, light and transportation, £3,900; Instruments, equipment, stores and research, £9,500; Grant in aid of Polar research, £2,000; Works services, £5,000; Telegraph, telephone and miscellaneous charges, £16,800; Superannuation, £1,300. Miscellaneous effective services: Compensation for losses, £10,000; Losses by exchange, payments of commission, etc., £500; Aerodrome guards furnished from the Iraq Army, £99,000; Telegraph and telephone charges, postage abroad, £63,500; Miscellaneous, £28,000; Terminal charges, in connection with Indian troops lately employed in Iraq, payable to the Government of India, nil; allowances to Ministers of religion, £8,000. Gross total, £367,000. Appropriations-in-aid, £26,000. Net total, £341,000. Net decrease, £17,000.

Vote 10.—Air Ministry.—Salaries and allowances of the Air Council and Department of the Secretary, £304,200; Salaries and allowances of the Department of the Chief of the Air Staff, £116,000; Salaries and allowances of the Department of the Air Member for Personnel, £43,700; Salaries and allowances of the Department of the Air Member for Supply and Research, £153,200; Salaries and allowances of the Directorate of Civil Aviation and the Accidents Branch, £22,700; Pay of messengers, cleaners, etc., £21,800; Contingent expenses, £900. Gross total, £662,500. Appropriations-in-aid, £5,500. Net total, £657,000. Net increase, £12,000.

Vote 11.—Half-Pay, Pensions and Other Non-Effective Services.—Rewards to officers and airmen, £350; Half-pay of officers, £7,000; Service and disability retired pay and gratuities of officers and nurses, £241,000; Wound pensions—officers, £530; Service and disability pensions and gratuities—airmen, £76,000; Pensions, gratuities and allowances to widows, children, etc., of deceased officers and airmen, £28,000; Civil non-effective payments—recurrent charges, £14,550; Civil non-effective payments—gratuities and other non-recurrent charges, £12,900; Injury grants, £8,170; Commutation of retired pay, pensions, etc., £33,500; Relief fund, £500; Miscellaneous non-effective payments, £8,500. Gross total, £431,000. Appropriations-in-aid, £38,000. Net total, £393,000. Net increase, £3,000.

MEMORANDUM BY THE SECRETARY OF STATE FOR AIR

THE gross total of Air Estimates for 1934 is £20,165,600, and the net total £17,561,000—being increases of £527,000 and £135,000 respectively on the current year's figures. The net increase would be £100,000 higher, but for the fact that allowance has been made for the receipt of an additional payment of approximately this amount from India in respect of Home Effective Charges, following on the report of the recent Tribunal on Indian Defence Expenditure.

That the rise is small, despite provision for the formation of the new units detailed below, is due to the continuance of the most stringent economy throughout all Votes and to the further postponement of all services, the completion of which is not a matter of urgent necessity.

The following table summarises the comparative figures for 1933 and 1934:—

—	1934	1933	+ or -
Gross Estimate	£ 20,165,600	£ 19,638,600	+ £27,000
Deduct Fleet Air Arm Grant	1,338,000	1,089,000	+ 249,000
Deduct other Appropriations-in-aid	1,266,600	1,123,600	+ 143,000
Net Estimate	17,561,000	17,426,000	+ 135,000

Disarmament

Notwithstanding the continued endeavours of His Majesty's Government, a Disarmament Convention has not yet been signed. The policy which this country has advocated in the sphere of air disarmament has been clearly stated in successive White Papers laid before Parliament. Pending consideration by the Permanent Disarmament Commission of yet more far-reaching measures, His Majesty's Government have made their primary object the attainment of air parity in first-line strength between the principal Powers, in order that a race in air armaments may at all costs be avoided. It is their earnest desire to achieve this end, if possible, by means of a reduction to the British level (or to any alternative figures upon which international agreement can be secured) of the strengths of those foreign Air Forces which at present so largely outnumber our own. Meantime, however, considerable programmes of air expansion have been approved in a number of foreign countries, and are already in several cases in process of actual execution. Air expenditure abroad is in fact showing a general upward trend, on a scale which in most cases far exceeds the small increase in the present Estimates.

Pending the results of the Disarmament Conference, however, the number of new units to be formed in this country is being curtailed to a minimum, and will, in fact, do little to bridge the widening gap between the present strengths of the Royal Air Force and of the air services of other great Powers. His Majesty's Government have, by their successive postponements of the modest Home Defence Scheme of 1923, now long overdue for completion, given abundant proof of the sincerity of their purpose to achieve air disarmament; they are under the necessity of making it equally plain that they cannot, in the interests of our national and Imperial security, accept a position of continuing inferiority in the air.

Strength, Distribution and Organisation of the Royal Air Force

Two new squadrons will be added to the Home Defence Force during 1934, which will leave a balance of eight squadrons still to form before the 52 squadrons of the 1923 programme have been completed. Further, two squadrons at present incorporated in one of the experimental establishments will be reorganised and reconstituted on an effective basis.

One new flying-boat squadron will also be formed with a view to its being stationed overseas at a later date.

In addition, two flights (the equivalent of one squadron) will be added to the Fleet Air Arm. The additional aircraft which will be comprised in these flights are well within the capacity of the carriers now in commission and of other ships fitted to carry aircraft.

By agreement between the Admiralty and Air Ministry the organisation of the units of the Fleet Air Arm provided for embarkation in aircraft carriers has reverted from a flight to a squadron basis, squadrons being organised by numbers of 12 or nine first-line aircraft. The flight basis of six or fewer aircraft is being retained for units organised to provide aircraft for embarkation in battleships and cruisers. The strength of 27 flights (the equivalent of 13½ squadrons), at which the first-line strength of the Fleet Air Arm was calculated in last year's memorandum, becomes, on the new basis of organisation, 12 squadrons and six flights, or the equivalent of 15 squadrons—to be increased in 1934, as already stated, by a further two flights, making a total of 16 squadrons.

The number of additional squadrons to be formed in the coming year is thus four in all, which will bring the total

strength of the Royal Air Force up to 81 regular squadrons, after allowing for the effects of the Fleet Air Arm reorganisation above described. In addition there are the 13 non-regular squadrons of the Home Defence Force.

Operational Activities

The Air Force units in Iraq, Palestine and Trans-Jordan, though not engaged in any notable operations during the past year, were confronted with situations of considerable difficulty and anxiety in connection respectively with the Assyrian troubles in Iraq and unsettlement in Palestine. While the British Forces took no part in the settlement of the former, transport aircraft of No. 70 Squadron evacuated a large number of distressed Assyrian families from the disturbed areas. In all about 800 non-combatants (old men, women and children) were transported by air from the Mosul district to Baghdad, where they were housed in surplus buildings in and around the air cantonment at Hinaidi.

At the request of His Majesty's Embassy at Baghdad, and with the concurrence of the Iraq Government, service aircraft were also used to convey the Assyrian patriarch, the Lady Surma and their immediate entourage from Iraq to Cyprus.

In the Aden Protectorate some tribal encroachments from across the frontier occurred in the summer in two isolated districts, and live-stock were looted and hostages taken. The situation was, however, restored bloodlessly and without recourse to active operations. The ubiquity and rapidity of action of the Air Force at Aden thus served once again to bring to a prompt and satisfactory ending an episode which might otherwise have required protracted operations and have proved costly alike in life and money.

Earlier in the year the Chief Commissioner of Aden, accompanied by the Officer Commanding the British Forces, made a tour by air of the Hadhramaut—an area which until very recent years had shown consistent hostility to European visitors. It was visited by service aircraft for the first time in 1929 and again in 1932, but the Chief Commissioner's visit on the present occasion was the first official tour of the interior which had been made by the political administration. Air survey of previously unmapped areas of the Protectorate was begun in May, 1933, and has since been carried out continuously over difficult country some 2,000 square miles in extent. Survey photography from the air has also been continued in British Somaliland, where work begun in December, 1931, has now been concluded. During the survey operations, which covered a period of about 15 months, the aircraft employed carried out 1,060 hours' flying (692 hours were spent on actual survey photography), as a result of which an area of more than 3,000 square miles was photographed. This is typical of the pacific rôle of the Royal Air Force and of the productive work in which its units overseas are constantly engaged.

Air Routes and Long-Distance Flights

A large number of long-distance and inter-command flights were again carried out in 1933. Thus a tour was made by six aircraft of No. 6 Squadron from Heliopolis (Egypt) to Nyasaland and Rhodesia and back—a distance of 9,000 miles. Four aircraft of No. 28 Squadron, a unit on the Indian establishment, flew from Ambala to Singapore and back, the outward and home journey being completed by regular stages in 19 days. A similar long-distance flight was undertaken by four aircraft of No. 36 Squadron—which is stationed at Singapore—to Peshawar and back. These flights each covered a distance of about 7,500 miles. Their object was to develop the technique of inter-reinforcement between air units of the Indian and of the Far Eastern Command and to test and inspect the intervening landing grounds. Inter-command flights were also carried out on a considerable scale between Egypt and Iraq. Particular attention is being given to making the aircraft which take part in these long-distance flights as far as possible self-contained and independent of supplies *en route*, and with this end in view large transport aircraft are being increasingly used to accompany them.

Three large transport aircraft belonging to the Middle East Command undertook a flight of over 12,000 miles to and from the West African Colonies. This is the first occasion on which these large aircraft have been used on a West African flight.

Mention may also be made of the further development of air communication through the Persian Gulf, which has been carried out by No. 203 (Flying Boat) Squadron. In

addition, this squadron in October, 1933, carried out the first through flight from Basra round the coast of the Arabian peninsula to Aden, the total distance covered being over 4,000 miles. The work of this unit is yet another example of the pioneer work which the Royal Air Force is continuously carrying out for the future development of commercial air routes.

Personnel and Training

Vote 1 (Pay, etc., of the Royal Air Force) stands at a net total of £4,210,000, thus showing a rise of £100,000 on the current year's figure.

In pursuance of previous investigations into the provision of the officer personnel of the Force on a basis of ordered and scientific planning, an inquiry has been completed in the course of the current year into the requirements of the Accountant Branch.

As a result a scheme has been evolved which allows for the filling of about two-thirds of the posts in this branch by permanent officers recruited from among young men who have received training and experience as accountants in civil life. The balance of one-third will be filled mainly by retired officers, preference being given to retired accountant officers. A small number of posts will, however, be reserved for warrant officers and for officers commissioned from warrant rank, thus further improving the career open to airmen. The scheme has been so devised as to avoid any increase in the cost of the Accountant Branch as a whole.

The policy under which advanced specialist officers for Engineering and Armament duties are obtained by commissioning graduates from the Universities with honours degrees in Engineering has now been extended to include advanced specialists in Signals. Entrants so qualified will be given a limited amount of further training in aeronautical engineering, armament or wireless telegraphy, as the case may be, and will be a source of strength to the service in dealing with the more advanced engineering, armament and signals problems. They will be commissioned in the General Duties Branch, will be taught to fly, and will throughout their career spend a part of their time on the ordinary duties of the service. They will also be eligible for the Staff College. They will thus combine a knowledge of flying and operational duties with expert specialist knowledge, and will have before them the chance of rising to posts of higher command as well as specialised technical appointments.

As a corollary to the training of pilots in instrument flying, the existing schemes for air pilotage training have been revised with a view to bringing pilots up to the high standard of navigational efficiency required to cope with the growing demands of night flying and cloud flying. While the service requires a small body of expert navigation specialists, the revised policy is based on the principle that every pilot should reach a good standard in air pilotage, which must not be regarded as the function merely of one expert in the squadron. The amount of air pilotage taught in *ab initio* flying courses is therefore being increased and, for this purpose, all flying instructors are being given special training in the subject. When young pilots reach the squadrons their further training will devolve on their flight commanders, and all flight lieutenants will be required to have reached a standard in air pilotage sufficient to enable them to give this training and will be given such short refresher courses as are necessary to this end.

In the memorandum accompanying 1933 Estimates reference was made to the review which had been undertaken of the requirements of the service in airmen of the different trades. Considerable progress has been made with this review and it is hoped during 1934 to formulate definite proposals in regard to all trades still outstanding. The scheme outlined last year for the amalgamation of the trades of fitter and rigger will begin to have practical effect towards the end of 1934 as aircraft apprentices trained under the new syllabus pass out of Halton.

A revised procedure for the recommendation and selection of airmen for re-engagement has been drawn up and promulgated. Selection will be made quarterly on a competitive basis between airmen of the same trade and length of service. The claims of applicants for re-engagement will be assessed on the basis of their service record for the four years preceding selection combined with recommendations as to their suitability for future service in higher rank rendered by their commanding officers over a period of three years prior to selection. This procedure,

which incorporates a number of improvements on that hitherto in force, is designed not only to allow of the most equitable consideration of the claims of all applicants, but also to ensure that the limited vacancies for re-engagement are filled by those airmen who will be the most valuable to the service in non-commissioned rank.

Auxiliary and Reserve Forces

There is in fact an increase in the provision for Auxiliary and Reserve Forces although Vote 7, at a net figure of £394,000, shows a reduction of £70,000 owing to the transfer to other Votes of the charges for the pay and allowances of regular personnel serving in the Cadre (Special Reserve) Squadrons. This follows from the decision to transfer from No. 1 Air Defence Group to other commands the executive control of these squadrons, as opposed to units of the Auxiliary Air Force.

The revised training scheme for the Royal Air Force Reserve, described in the memorandum accompanying last year's Estimates, has been successfully inaugurated, and a considerable improvement in the quality of the training, both air and ground, has resulted. As the new syllabus involves an increased amount of flying and ground training, it can no longer conveniently be performed by airman pilot reservists within the 12 days' period to which all reservists are limited by the existing statute, and legislative sanction is being sought accordingly for an extension of this period.

The strengths of Special Reserve and Auxiliary Air Force personnel show slight increases over last year's numbers. Certain Cadre and Auxiliary Air Force squadrons, in once more taking part with regular squadrons in the annual Home Defence Exercises, gave further evidence of the very satisfactory standard of training which these units have attained. The two Scottish squadrons of the Auxiliary Air Force also participated in the coastal exercises which took place in co-operation with the Navy in the autumn.

The strength of both University Air Squadrons has been maintained at the full quota of 75 members throughout the year.

Technical Equipment

The net total of Vote 3 (Technical and Warlike Stores) is £7,220,000, an increase of £17,000 on the corresponding figure for 1933.

As a result of the continued search for all possible savings which will not react on safety or unduly impair efficiency, coupled with such developments as the longer life of metal machines, and the extension of the period between overhauls of both engines and aircraft, the necessary equipment for the new formations above detailed is being provided without any appreciable increase in the net amount of the Vote. No scope now remains for further curtailment of normal expenditure, and a rise in this Vote will be inevitable in the future.

Among new aircraft to be purchased in the coming year are included two types of autogiro. One of the latest type of these aircraft is being added experimentally to the establishment of each Army Co-operation squadron at home, following a brief preliminary trial during Army manoeuvres last autumn. Further, a five-seater autogiro of civil design has been ordered for experimental purposes, and should be delivered in the near future.

Greater use is being made of stainless steel in the structure of flying boats and aircraft operating over the sea, with a view to overcoming difficulties due to corrosion. All flying boats are now fitted with metal hulls, the last wooden hull having gone out of service during the current year.

Provision is included for the replacement of a number of obsolete and worn-out motor vehicles by modern patterns, and the gradual introduction of new vehicles has rendered possible a further reduction in expenditure on spare parts. Requirements for marine craft are somewhat lower than last year.

A general decrease in the cost of aviation petrol, both at home and overseas, in comparison with twelve months ago, is reflected in a substantial reduction in the financial provision for this item. The octane value of the standard service fuel was increased in 1933, and a further improvement is in prospect. In view of the satisfactory results obtained by the squadron which has been operating on petrol produced from British coal during the past year, the use of this fuel will be extended to other squadrons in 1934.

Research and Technical Development

The provision for experimental services (shown in Appendix I) is £1,428,000, an increase of £43,000 on the figure for 1933. There is an urgent demand for further research and development work which can no longer be postponed.

The large wind tunnel at the Royal Aircraft Establishment is now expected to commence operation in the autumn of this year. It is of the open-jet type with a nozzle 24 ft. in diameter. It will be driven by an electric motor of 2,000 h.p., which should give a maximum air speed of 115 miles per hour. The tunnel is large enough to accommodate the actual fuselages of aircraft complete with engine and centre section, and it will be possible for the first time in this country to make full-scale experiments on the characteristics of aircraft with airscrews running. The tunnel will also greatly facilitate the investigation of engine cooling, and such aerodynamical problems as the reduction of body drag. Data bearing on these subjects are at present largely derived from flying tests, and it is confidently expected that this tunnel will provide a means of obtaining much of the information required in a shorter time and at materially lower cost.

A full year's experience has now been obtained with the Seaplane Testing Tank at Farnborough, and results have entirely justified the design adopted. The advantages of this small high-speed tank for investigating problems connected with the behaviour of seaplanes on the water have been amply demonstrated. Research work already carried out has produced valuable information on such problems as the so-called "porpoising" of seaplanes, which is caused by instability on the surface when approaching flying speed.

The compressed-air tunnel at the National Physical Laboratory and the free spinning wind tunnel at Farnborough are both in regular operation. Use of the latter tunnel for tests of new types in model form has rendered it possible to improve many designs before commencing construction of full-scale aircraft.

Provision has been taken for modernising one of the 7-ft. wind tunnels at the Royal Aircraft Establishment by converting it to the open-jet type.

The autogiro has made a noticeable advance in the past year through the new system of control confined solely to movements of the rotor.

Considerable progress has been made in engine design. A development which shows particular promise is an air-cooled engine operating with a sleeve valve. The evaporative cooling of water-cooled engines is also receiving special study. A variety of types of compression ignition engine are being actively developed.

A new type of dope has been developed which can be applied satisfactorily to fabric surfaces in the open air over a wide range of climatic conditions.

Airships

The Royal Airship Works at Cardington and the overseas bases at Karachi and Ismailia remain on a care and maintenance basis in accordance with approved policy.

The small nucleus staff at Cardington is keeping abreast of technical progress in airship design and construction abroad, and information in regard to lighter-than-air development in foreign countries is being carefully examined and collated. A stressing experiment with a bay of the airship *R.100* is in progress.

One of the airship sheds at Cardington is being used for the storage of aircraft held in reserve by the Royal Air Force. The second shed provides accommodation for the Kite Balloon Experimental Section. A portion of the aerodrome in the vicinity of the mooring tower is to be used by the Royal Air Force for a temporary wireless station for long-distance reception.

By the courtesy of the Zeppelin Company, a member of the airship staff has recently visited the airship works at Friedrichshafen.

Works

The net total of Vote 4, at £1,675,000, shows an increase of £65,000 over the corresponding figure for 1933. This is primarily due to the increased provision required for the new Air Base in Iraq, the construction of which is proceeding in accordance with the undertaking contained in the Anglo-Iraq Treaty of 1930. Otherwise, the programme for 1934 contains no major commitments in regard to new stations, provision being generally confined to the improvement and reconstruction, where necessary, of existing

stations, including the erection of accommodation for a second landplane squadron, and the preparation of an additional landing ground, at Singapore.

The scheme for the provision of an aerodrome and the reconstruction of buildings at Lee-on-the-Solent to meet the growing needs of the Fleet Air Arm has now reached a stage at which it has become necessary to undertake further substantial measures of replacement of temporary accommodation.

Provision is also made for continuing the improvements already in hand on the air route between Calcutta and Singapore by means of a chain of intermediate landing grounds, which will enable this route to be used without undue risk at all seasons of the year.

A suitable allowance has been made for anticipated under-spending.

Civil Aviation

The gross total of Vote 8 is £673,000, of which £126,000 is repayable by the Government of the Union of South Africa and other African administrations in respect of the Egypt-South Africa air service. As a result of further projected developments both in this country and overseas, the net total at £513,000 shows an increase of £23,000 over the figure for 1933 and represents the highest level at which this Vote has stood during the past ten years.

In pursuance of suggestions made by the Estimates Committee, certain changes have been made this year in the form of the Vote.

The subsidy for the Egypt-South Africa service is reduced by £30,000 to £171,000 in accordance with the terms of the agreement with Imperial Airways, and the payments by the African administrations are also lowered by £20,000. The subsidy payments to the company in respect of their European services and their England-India service remain the same as last year.

Increased provision has been made in respect of the extension of the England-India service to Singapore. The first flight on this extension took place in December last, since when the service has been regularly operated by Imperial Airways and Indian Trans-Continental Airways in alternate weeks. His Majesty's Government in Australia have not yet been able to complete their arrangements for the operation of the last link in this key Imperial air route, but it is hoped that the service between Singapore and the Commonwealth may be in operation by the autumn of 1934, thus establishing through connection by air between England and Australia. His Majesty's Government in New Zealand have offered an annual contribution of £5,000 towards the subsidy in respect of the Australian service, £3,000 of which will accrue to the United Kingdom, and £2,000 to the Australian Exchequer.

A scheme is under discussion with the Bermudan Government for the establishment of an air base at Bermuda and the operation by Imperial Airways, in conjunction with American interests, of a weekly air service to connect the Colony with New York. It is proposed to make a contribution from Air Votes to the subsidy required for this service and a sum of £10,000 has been included for the purpose.

The subhead for works services shows an increase of £3,500 over that for 1983. In addition to improving the

ground organisation and lighting of the air route between Croydon and the coast, provision has been taken for the establishment of a new wireless station at Renfrew and for further wireless facilities in the north of England and elsewhere in connection with projected air services to connect with Northern Ireland and the Continent. It is also proposed to erect a central weather broadcasting station at Cranwell, and to undertake the dissemination of regular weather reports from there instead of from Heston as at present. The erection of a night flying beacon in Trans-Jordan on the Cairo-Karachi airway is under consideration.

Financial assistance will be continued to approved Light Aeroplane Clubs and £16,000 has been included for this purpose.

The question of the control of private flying and certain other important civil aviation questions, such as that of compulsory insurance against third-party risks, have been remitted to an independent Committee under the chairmanship of the Rt. Hon. Lord Gorell.

Meteorology

The net provision for meteorological services in Vote 9 amounts to £144,500, being an increase of £5,000.

This increase is due to the growing requirements of the Royal Air Force in connection with the development of cloud and other types of flying, for which accurate and detailed meteorological information is essential. For these purposes meteorological stations are being established at Manston and Mildenhall, and meteorological officers are being posted to Andover, Abingdon and Pembroke Dock. Additional staff will also be required in the Middle East and in Iraq. As a result of these developments the provision for salaries at out-stations shows an increase of £6,000. A small additional expenditure will also be necessary for consequential works services. These increases are, however, partly offset by savings totalling £2,000 under such heads as travelling, purchase of instruments, and telegrams.

The Estimate contains £2,000 for expenditure in connection with the International Polar Year. This sum is the third and final instalment of the total of £10,000 allocated to this enterprise. The British party has now returned from Fort Rae in Canada and the data obtained will be published in due course.

Air Ministry

Vote 10 (Air Ministry) at a net total of £657,000 shows a rise of £12,000, of which approximately £7,000 is due to the automatic effects of incremental scales and the remainder to certain increases in staff which can no longer be postponed.

As mentioned in last year's memorandum, however, the numbers and cost of the headquarters staff remain notably lower than in 1921, despite the very extensive development both of service and civil aviation since that date.

A reorganisation and redistribution of duties is being effected between the departments of the Chief of the Air Staff and the Air Member for Personnel, which should make for greater efficiency.

LONDONDERRY.

Air Ministry.

February 26, 1934.



Paris Aero Show, 1934

As previously announced, the Fourteenth International Aeronautical Exhibition will be held in the Grand Palais des Champs Elysees, Paris, from November 16 to December 2, 1934. As this exhibition will mark the end of the first 25 years of aviation, it may be expected that a great effort will be made to make the show even more interesting than previous ones. Applications for stands made before April 30, 1934, will receive priority over those received later, and the organisers point out that members of the French Chambre Syndicale (corresponding to our S.B.A.C.) will be the first to have their applications considered. Then will follow associate members of the Chambre, and finally French exhibitors who are not associated with the Chambre. Foreigners come last, but it is pointed out that foreign firms which have exhibited at three consecutive Paris aero shows will receive preference in drawing lots for stand space. Applications for stands at the show should be made to the Commissaire Général.

14^e, Exposition Internationale de l'Aéronautique, 4, Rue Galilee, Paris, 16^c.

Short wave wireless wanted

At a meeting of the Guild of Air Pilots and Air Navigators of the British Empire on February 26, Capt. Duncan Sinclair expressed the opinion that most of the interference now experienced in wireless operation, due to atmospherics, ignition circuits and other causes, would be obviated by a change to a shorter wave length than the 900-metre band at present used; particularly so did he think that this would be the case with direction finding, although this had not yet been found to be a commercial proposition. He also thought that the time had come to provide airports all round London and for the provision of a metropolitan airport which would itself not actually be in London. The provision of this latter would, he felt, provide an opportunity for the installation of a modern wireless-cum-telephone system whereby business men flying in aircraft could speak direct to their offices if desired.

THE ROYAL AIR FORCE

London Gazette, February 27, 1934

General Duties Branch

Lt. R. W. Wicks, R.N., Flt. Lt. R.A.F., ceases to be attached to R.A.F. on return to Naval duty (Feb. 8); Air Commodore W. F. MacN. Foster, C.B., C.B.E., D.S.O., D.F.C., is placed on half-pay list, scale A (Feb. 6); Sqdn.-Ldr. H. G. W. Lock, D.F.C., A.F.C., is placed on half-pay list, scale A, from Feb. 2 to 14 inclusive; Sqdn.-Ldr. F. W. Walker D.S.C., A.F.C., is placed on half-pay list, scale A, from Jan. 6 to 13 inclusive. The follg. Flying Officers are transferred to Reserve, class A:—R. M. Smith (Feb. 17); G. H. A. Blackwood, A. F. C. Booth, R. A. Davies, C. S. Gill, T. W. Hoyle, G. P. Longfield, V. R. Moon, G. E. Mustard, H. D. Primrose, G. N. Roberts, H. L. Smith (Feb. 22).

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

Sister Miss J. W. Walker, A.R.R.C., is placed on retired list at her own request (Feb. 28).

ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Flt. Lt. H. C. Lee is transferred from class A to class C (Feb. 20); F/O. P. T. Petley relinquishes his commn. on appointment to a commn. in the Regular Army (Feb. 3).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders: H. M. Probyn, D.S.O., to H.Q., R.A.F. Middle East, Cairo, 13.2.34, for duty as Senior Personnel Staff Office vice G/Capt. J. B. Graham, M.C., A.F.C. I. T. Lloyd, to Station H.Q., Mount Batten, 21.2.34, to Command, vice W/Cdr. J. O. Andrews, D.S.O., M.C. E. A. B. Rice, M.C., to R.A.F. Base, Calshot, 23.2.34, for navigation duties, vice W/Cdr. T. Q. Studd, D.F.C.

Squadron Leaders: A. Durston, A.F.C., to H.Q., Inland Area, Stanmore, 19.2.34, for Personnel Staff duties, vice S/Ldr. W. R. Cox, M.C., A.F.C. R.A. George, M.C., to H.Q., Far East Command, Singapore, 16.2.34, for duty as Senior Air Staff Officer, vice F/Lt. G. M. Knocker. G. H. Boyce, A.F.C., to No. 810 (F.T.B.) Sqdn., 7.2.34, to Command, vice S/Ldr. T. A. Warne-Browne. C. B. Cooke, to No. 1 School of Tech. Training (Apprentices), Halton, 22.2.34, for Engineer duties with No. 2 (Apprentices) Wing. W. W. Hart, M.B.E., to H.Q., Central Area, Abingdon, 22.2.34, for Signals duties, vice F/Lt. W. E. G. Mann. F. L. B. Hebert, to H.Q., Mediterranean, Malta, 16.2.34, for Air Staff duties, vice S/Ldr. T. W. Elmhurst, A.F.C. H. M. Massey, M.C., to No. 6 (B) Sqdn., Ismailia, 31.1.34, to Command, vice S/Ldr. J. P. Coleman, A.F.C. C. Turner, A.F.C., to Central Flying School, Wittering, 21.2.34, for Engineer duties, vice S/Ldr. O. C. Bryson, M.C., D.F.C., A.M.

Flight Lieutenants: F. D. Biggs, to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. H. G. Brookman, to No. 2 (I.W.) Station, Risalpur, India, 15.2.34. B. E. Embry, A.F.C., to No. 1 (I.W.) Station, Kohat, India, 15.2.34. H. E. Nowell, to No. 28 (A.C.) Sqdn., Ambala, India, 15.2.34. A. E. Paish, to No. 60 (B) Sqdn., Kohat, India, 15.2.34. J. H. Pool, to Aircraft Depot, Karachi, India, 15.2.34. F. W. Sinclair, D.F.C., to No. 28 (A.C.) Sqdn., Ambala, India, 15.2.34. A. W. Hunt, to Central Flying School, Wittering, 14.2.34. J. A. S. Outhwaite, to Air Armament School, Eastchurch, 19.2.34. B. B. Caswell, to No. 812 (F.T.B.) Sqdn., 6.2.34. R. J. Montgomery-Moore, to No. 3 Flying Training School, Grantham, 22.2.34.

Flying Officers: H. J. Kirkpatrick, to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. H. D. Gilman, to No. 600 (City of London) (B) Sqdn., Hendon, 17.2.34. L. M. Hooper, to No. 5 Flying Training School, Sealand, 14.2.34. W. M. Keddie, to Administrative Wing, Halton, 21.2.34. G. N. E. Tindall-Carill-Worsley, to R.A.F. College, Cranwell, 21.2.34.

Pilot Officers: B. H. Becker, to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. A. F. R. Bennett, to No. 28 (A.C.) Sqdn., Ambala, India, 15.2.34. B. A. Chacksfield, to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. H. M. T. Everard, to No. 60 (B) Sqdn., Kohat, India, 15.2.34. P. H. Holmes, to No. 31 (A.C.) Sqdn., Quetta, India, 15.2.34. N. C. Jones, to No. 11 (B) Sqdn., Risalpur, India, 15.2.34. E. B. King, to No. 31 (A.C.) Sqdn., Quetta, India, 15.2.34. C. F. Pearce, to No. 20 (A.C.) Sqdn., Peshawar, India, 15.2.34.



Royal Air Force Club

THE annual general meeting of the Royal Air Force Club will be held at the Club on Wednesday, March 14.

The Royal Air Force Memorial Fund

Change of Title

THE title "The Royal Air Force Memorial Fund" has been changed to "The Royal Air Force Benevolent Fund."

Nomenclature of Aero-engine—Lynx IV*

A NEW engine of the Lynx series, differing from the Lynx IV only in that it is fitted with Jaguar IVC type pistons, connecting rods, cylinders and valve gear, modified cam drum, and re-balanced crankshaft, is being introduced into the service. The rating is 205/215 b.h.p. at sea-level, at 1,900 r.p.m., and the official name is Lynx IV.* A.P. No. 1287 will be used for this aero-engine.

Parliamentary Air Committee

THE annual meeting of the Parliamentary Air Committee was held at the House of Commons on Thursday, February 15, 1934. The following members were appointed officers of the Committee for the ensuing year. Chairman:

SPECIAL RESERVE

General Duties Branch

P/O. W. S. Gardner is confirmed in rank (Jan. 26); F/O. A. T. Laws resigns his commn. (Nov. 5, 1933).

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—P/O. R. J. Bushell is promoted to rank of Flying Officer (Feb. 10).

No. 607 (COUNTY OF DURHAM) (BOMBER) SQUADRON.—J. E. McComb is granted a commn. as Pilot Officer (Feb. 7).

Stores Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—Fit. Lt. G. Baker (Flt. Lt., R.A.F., Retired) resigns his commn. on ceasing to serve as a civilian stores officer with Auxiliary Air Force (Feb. 25).

Stores Branch

J. A. H. Tuck, to No. 39 (B) Sqdn., Risalpur, India, 15.2.34. C. H. T. Warner, to No. 39 (B) Sqdn., Risalpur, India, 15.2.34. R. G. Watson, to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. A. H. Allen, to No. 4 (A.C.) Sqdn., S. Farnborough, 18.2.34. L. W. Burgess, to R.A.F. Base, Calshot, 18.2.34. R. T. Gething, to R.A.F. Base, Calshot, 18.2.34. D. G. Lewis, to No. 43 (F) Sqdn., Tangmere, 18.2.34. J. K. Rotherham, to No. 17 (F) Sqdn., Upavon, 18.2.34. F. E. H. Cooper, to No. 70 (B.T.) Sqdn., Hinaiidi, Iraq, 26.1.34. G. W. Golledge, to No. 70 (B.T.) Sqdn., Hinaiidi, Iraq, 26.1.34. N. W. D. Marwood-Elton, to No. 30 (B) Sqdn., Mosul, Iraq, 26.1.34. A. Ross, to No. 30 (B) Sqdn., Mosul, Iraq, 26.1.34. A. G. Strutt, to No. 84 (B) Sqdn., Shaibah, Iraq, 26.1.34. H. C. S. Vetch, to No. 70 (B.T.) Sqdn., Hinaiidi, Iraq, 26.1.34.

Acting Pilot Officers: P. H. Dunn, to R.A.F. Base, Calshot, 18.2.34. D. N. J. P. Leggett, to No. 4 (A.C.) Sqdn., S. Farnborough, 18.2.34. R. H. S. McConnell, to R.A.F. Base, Calshot, 18.2.34. P. A. McWhannell, to No. 7 (B) Sqdn., Worthy Down, 18.2.34. H. M. T. Neugebauer, to No. 4 (A.C.) Sqdn., S. Farnborough, 18.2.34. J. C. Northey, to No. 7 (B) Sqdn., Worthy Down, 18.2.34. F. Rump, to R.A.F. Base, Calshot, 18.2.34. H. M. W. Thomas-Ferrand, to No. 99 (B) Sqdn., Upper Heyford, 18.2.34. J. B. P. Thomas, to No. 111 (F) Sqdn., Hornchurch, 18.2.34. G. T. Toland, to No. 101 (B) Sqdn., Andover, 18.2.34. J. E. Townsend, to R.A.F. Base, Calshot, 18.2.34. S. J. McN. Newman, to No. 55 (B) Sqdn., Hinaiidi, Iraq, 26.1.34.

Stores Branch

Squadron Leader H. E. T. Crocker, to H.Q., Central Area, Abingdon, 27.2.34.

Flying Officers: A. E. Evans, D.F.C., to No. 5 (A.C.) Sqdn., Quetta, India, 15.2.34. E. N. Lowe, to Aircraft Depot, Karachi, India, 15.2.34. C. W. Goodchild, M.B.E., to No. 4 Stores Depot, Ruislip, 19.2.34. A. E. Connolly, to Station H.Q., Boscombe Down, 27.2.34. J. S. French, to Station H.Q., Northolt, 18.2.34.

Accountant Branch

Squadron Leader F. W. Arthurton, to H.Q., Fighting Area, Uxbridge, 24.2.34, for Accountant duties, vice F/Lt. A. C. Lobley.

Fight Lieutenants: F. M. Hall, to No. 3 Flying Training School, Grantham, 22.2.34. S. W. Hill, to Station H.Q., Farnborough, 27.2.34. A. C. Lobley, to R.A.F. Depot, Uxbridge, 26.2.34.

Flying Officers: E. A. Biddle, to No. 207 (B) Sqdn., Bircham Newton, 19.2.34. P. Griffiths, to Station H.Q., Andover, 20.2.34.

Medical Branch

Flight Lieutenant C. G. Harold, to Station H.Q., Mount Batten, 20.2.34.

Flying Officer J. L. Walsh, to No. 2 (I.W.) Station, Kohat, India, 15.2.34.



Rear Admiral Sir Murray Sueter, C.B., M.P. Vice-Chairman: Capt. Harold Balfour, M.C., M.P. Hon. Secretary: Mr. Oliver E. Simmonds, F.R.Ae.S., M.P. Hon. Assistant Secretary: Mr. B. N. H. Whiteside, M.P. It was decided to hold a special meeting of the Committee on Tuesday, February 27, to discuss the present position of our air defences, with special reference to any action that members might desire to take in the course of the debate on the Air Estimates. Capt. Rt. Hon. F. E. Guest, C.B.E., D.S.O., M.P., gave notice that at that meeting he would move the following resolution:—"That the Air Committee of the House of Commons view with such concern the lack of air defence for Great Britain, and of London in particular, that they will be unable to vote for the Air Estimates presented by the Government unless the full programme of 52 air defence regular units, which was decided in 1923 to be the minimum required, is immediately commenced and completed without delay."

R.A.F. Staff College Examination

THE next qualifying examination for the R.A.F. Staff College will be held from Tuesday, January 22, to Thursday, January 24, 1935, inclusive.

THE INDUSTRY

High grade quenching oils

AN arrangement has been entered into between G.W.B. Electric Furnaces and Shell-Mex & B.P. whereby new high grade quenching oils will be placed on the market. These oils are being specially manufactured by Shell-Mex & B.P. in close collaboration with Wild-Barfield Electric Furnaces. These oils will be known as Shell-Wild-Barfield Quenching Oils, and will be obtainable from either G.W.B. Electric Furnaces, London and Dudley, or from any branch of Shell-Mex & B.P.

For club displays

FOR the coming season Air Travel, Ltd., will be sending their "Silver Trio" round the country on its own and not in conjunction with any other display or air circus. They will be using the same three Avros ("Mongoose") which they operated with Sir Alan Cobham's display last year, and will be joyriding at a large number of towns in the South and Midlands. Messrs. Kingwill, Miller and Kemp will be the pilots, and under Mr. F. J. Holmes this band has probably a greater experience of this and display work than anyone else in the country. Besides their scheduled displays they are open to give a show and do joyriding at any club meetings, so secretaries and others, before fixing up their programmes, would be well advised to get in touch with the company at Penshurst Aerodrome, Leigh, Kent.

Multiple-lens aerial cameras in mapping

THE Technical Staff of the Fairchild Aerial Camera Corporation, of 62-10, Woodside Avenue, Woodside, New York, has prepared, under the above title, an exceptionally helpful book, the purpose of which is to meet the demand of civil and military engineers and others for information regarding multiple-lens cameras, their operation, their field of application and the method of utilising photographs made with them. The book is divided into five chapters, "The Aerial Camera," "The Aerial Photograph," "Development of Mapping," "Economic Considerations," and "Planning a Mapping Mission." Mathematics necessary for the explanation of the theory of the rectifying camera and instructions for the calibration of multiple-lens cameras are given in appendices. The price of the book is five dollars.

New A.S.T. appointments

FLT. LT. E. V. MAJOR, who has just completed his medium service commission in the Royal Air Force, has recently been appointed to the office of Chief Ground Instructor at Air Service Training, Ltd. Flt. Lt. Major, who is one of the few possessors of a First Class Air Navigator's licence, has been engaged on instructional duties in navigation for the past seven years at No. 2 Flying Training School at Digby. Another new appointment at A.S.T. is that of Flt. Lt. G. D. Middleton, who is leaving the Royal Air Force to take up the post of seaplane instructor which has become vacant by the appointment of F/O. W. F. Murray to the new flying school in Hong Kong. Flt. Lt. Middleton's long experience of marine aircraft should be a great asset to the school.

The Irvin air chute

CAREFUL records kept of the number of lives saved by the "Irvin Air Chute" show that 900 aviators in 32 countries owe their lives to the emergency use made of this parachute, which is the only one carried by the British Air Force. Ten thousand of the parachutes have been turned out from the Letchworth factory of the firm and in no single instance has a 'chute failed to fulfil its life saving task when called upon to function. In addition to the Letchworth factory, the parachute is being produced in six factories in other countries in large numbers. The wide use made of the Irvin Air Chute is a tribute to the skill and thoroughness of its craftsmanship.

Eagle aircraft cameras

DURING last summer a very successful tour of the Baltic States was carried out by Mr. P. T. Griffith, A.F.R.Ae.S. Following this, another tour was arranged, and the company engaged the services of Sqd. Ldr. P. R. Burchall, who took with him to Turkey a complete equipment of Eagle cameras. As a result of Sqd. Ldr. Burchall's work, Williamson's cameras were chosen in face of both French, German and American competition. In addition, Eagle aircraft cameras, during the last twelve months, have

been introduced into Poland, Denmark, Lithuania and Persia, also repeat orders have been received from some of the forty countries which have already used Williamson's cameras.

An aviation appointment

READERS will be glad to learn that Mr. W. Faust has been appointed by the Socony Vacuum Co., Inc., of New York, to take charge of the Vacuum companies aviation activities throughout the world. Mr. Henry White, who it will be remembered was recently flying over here on the companies business, will be associated with Mr. Faust in New York.



"Punch" du Maurier number

Punch celebrates the centenary of George du Maurier in a special Supplement to the current number. The pictures chosen illustrate the many-sided activities of an artist who was at once the impartial satirist of vulgar parvenus and parasitic aristocrats, and at the same time a firm believer in good manners and good breeding. For du Maurier was an early apostle of Eugenics who, long before the cult of athletics had begun to affect the stature and build of English girls, devoted his pencil to glorify the Junoesque type of English beauty. The pictures are prefaced by a genial anecdotic appreciation of du Maurier from the pen of Mr. Guthrie ("F. Anstey"), the author of *Vice Versa* and *Voces Populi*, who knew him intimately from 1883 onwards, and from 1887 to 1896 was his colleague on the staff of *Punch*. The opening illustration of the Supplement is du Maurier's first contribution to *Punch* in 1860, and contains portraits of himself and of Whistler.



PUBLICATIONS RECEIVED

Amateur Adventure: The Story of a Record Flight to Madras. By K. C. Gandar Dower. London: Rich & Cowan, Ltd. Price 5s.

Causes of Detonation in Petrol and Diesel Engines. By G. D. Boerlage and Dr. W. J. D. van Dyk. Institution of Automobile Engineers, Watergate House, Adelphi, London, W.C.2.

The College of Aeronautical Engineering: Prospectus, 1934-35. The College of Aeronautical Engineering, Chelsea, S.W.3, and Brooklands Aerodrome, Surrey.

Flying as a Career. 2nd Edition. By Major O. Stewart, M.C., A.F.C. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.



NEW COMPANIES REGISTERED

B. C. R. MOTORS, LTD.—Capital £500 in £1 shares. Acquiring (1) the business known as "Marine Aero and Automobile Engineering Service" carried on by K. D. MacGregor-Bowron at St. Mary's Lodge, Paignton, and (2) the business known as "Compton Garage" carried on by C. D. D. Campbell at Compton Garage, St. Marychurch, Torquay, manufacturers of and dealers in motor cars, cycles, boats, aeroplanes, etc., providers of hangars, sheds, aerodromes, etc. First directors are: Kenneth D. MacGregor-Bowron, St. Mary's Lodge, Paignton, aero and motor engineer. Charles D. D. Campbell, Lloyd's Bank House, St. Marychurch, Torquay, motor engineer. Philip I. J. C. de Walton Reade, Seymour, Newton Abbot, Devon, law student. Secretary: P. I. J. C. de Walton Reade. Solicitors: Hooper and Wollen, Carlton House, Torquay.

AIR AND GENERAL LTD., 244, Edgware Road, W.2.—Capital, £500 in £1 shares. Booking and charter agents for all forms of air, sea and land travel, etc. Permanent directors, Robert S. Hunter, 40, Gladstone Court, Anson Road, Willesden, N.W.2. Evelyn R. Reid, 50, Home Park Road, Wimbledon, S.W.19 (both directors of the Car Collection Co. Ltd.).

UNIVERSAL TRAVEL BUREAU, LTD., 4, Charing Cross, Trafalgar Square, S.W.1.—Capital, £100 in £1 shares. Acquiring the general travel agency business known as the "Universal Travel Bureau," booking agents for persons and goods by road, rail, sea and air. Directors: Douglas C. Powell, 4, Charing Cross, Trafalgar Square, S.W.1. Wm. A. Wilkins, 68, Fairview Road, Stamford Hill, N.



INCREASE OF CAPITAL

AIRPORTS, LTD. (Manufacturers of aerial conveyances, etc. Victoria Coach Station, 164, Buckingham Palace Road, S.W.1). The nominal capital has been increased by the addition of £19,800 beyond the registered capital of £200. The additional capital is divided into 18,800 ordinary and 1,000 founders' shares of £1.



PATENT AERONAUTICAL SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.e. = internal combustion; m. = motors (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1932

Published March 8, 1934

- 21,718. R. D. PARKER. High-speed hydroplanes, seaplanes-floats, flying-boat hulls, etc. (405,615.)
- 22,541. R. C. QUILTER and J. GREGORY. Pack parachutes. (405,693.)
- 33,528. BENDIX AVIATION CORPORATION. Clutch-control mechanism. (405,775.)

APPLIED FOR IN 1933

Published March 8, 1934

- 1,631. BARR AND STROUD, LTD., and J. W. FRENCH. Cameras for aeronautical photography. (405,792.)
- 1,658. SPERRY GYROSCOPE CO., INC. Remote control devices. (405,794.)
- 5,955. FAIREY AVIATION CO., LTD., and D. L. H. WILLIAMS. Cooling systems of internal-combustion engines on aircraft. (405,812.)